SCIENTIFIC AMERICAN

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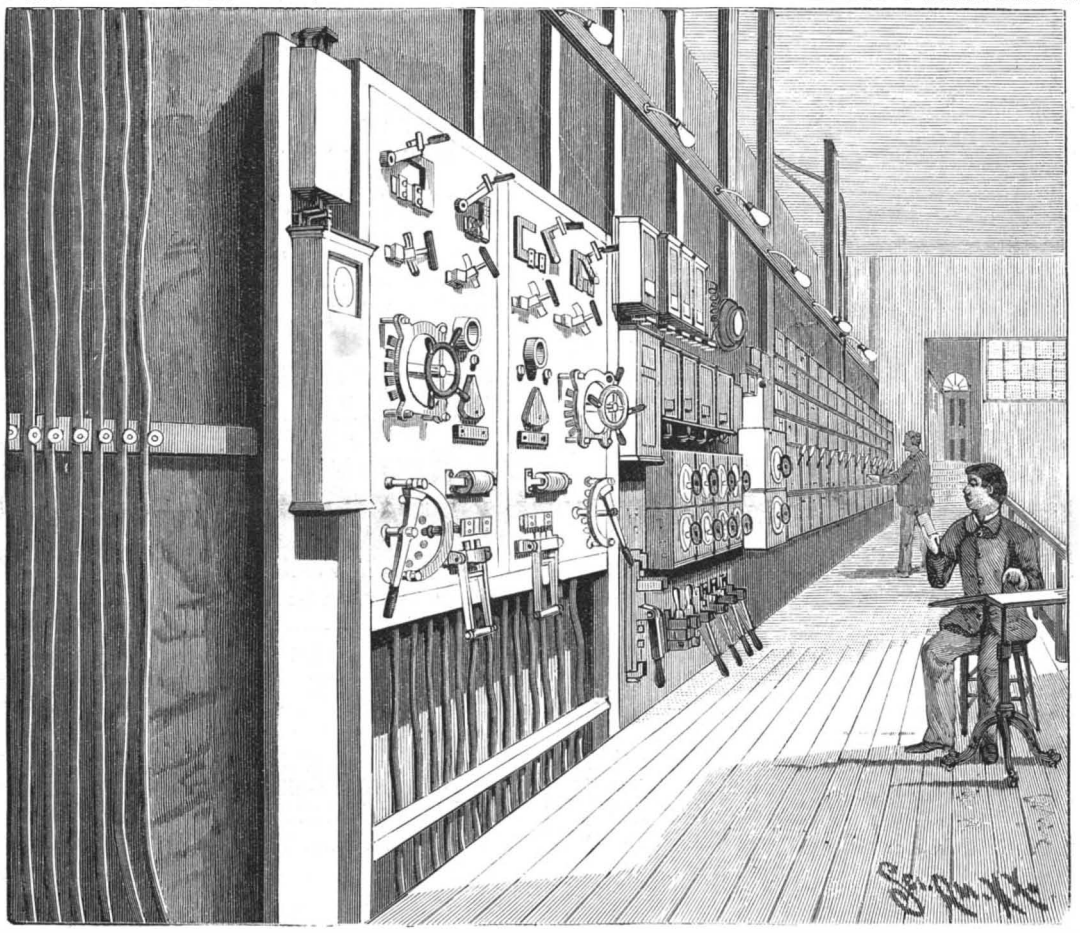
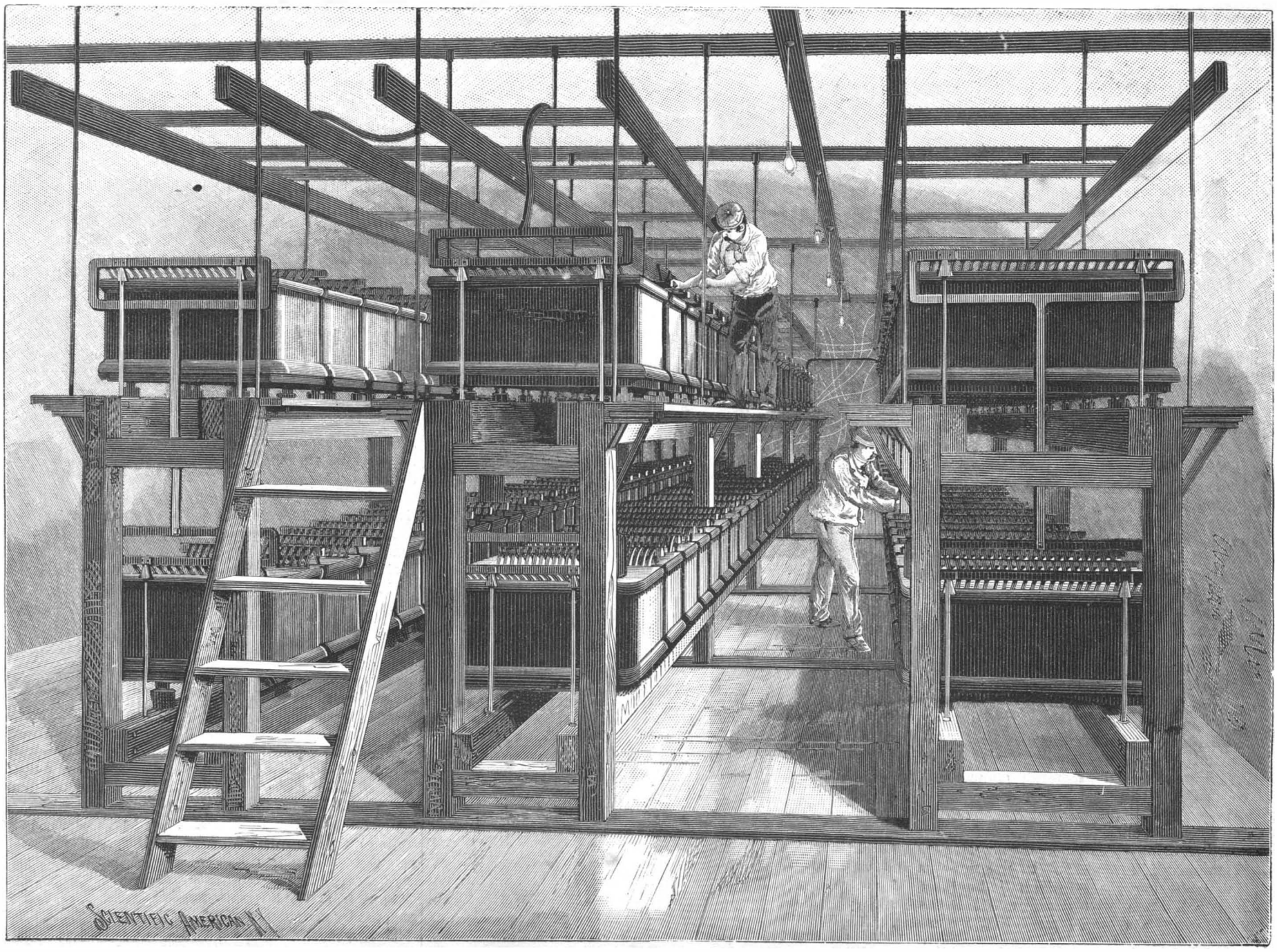
A STORAGE BATTERY FOR CENTRAL STATION SERVICE.

Since the invention of the accumulator by Gaston Plante, in 1860, many modifications of the original storage battery have been devised and put into use, most of them being more or less marked departures from the Plante form. Some years since, Mr. Howell, of the Crompton-Howell Electrical Storage Company, Limited, of London, England, made an important improvement on the invention of Plante, by producing lead plates having enormously extended surfaces, the lead being made in a form of sponge, the pores being of such a character as to permit the electrolyte to readily penetrate the interior of the plate. These plates were formed according to the invention of Mr. Plante, and the result was a storage battery of enormous capacity and great durability. This battery, which has been in successful continued use in England for five years, has proved of great utility in central station lighting.

Recently, this system was introduced into this country by the Edison Illuminating Company, at the 53d Street central station, where they are daily used to help out the dynamos when the demand for current is very great. They are also used for supplying current when the engines and dynamos are at rest. The charging is done when the dynamos would otherwise be running with a light load. This station is provided with two batteries, each consisting of a series of 70 cells of 61 plates each. One series is connected with the positive and neutral conductors of the three-wire system, the other series being connected with the negative conductor and the neutral conductor of the system. Each cell has a capacity of 1,000 ampere hours. These cells are each supported upon a board resting on glass insulators and their terminals are connected with heavy main conductors which are also supported on insulators. The containing cells are made of lead and all of the connections are massive. The cells are supported upon racks so as to be accessi-



THE SWITCHBOARD GALLERY, FIFTY-THIRD STREET STATION.



STORAGE BATTERY PLANT OF THE EDISON ILLUMINATING COMPANY, NEW YORK.

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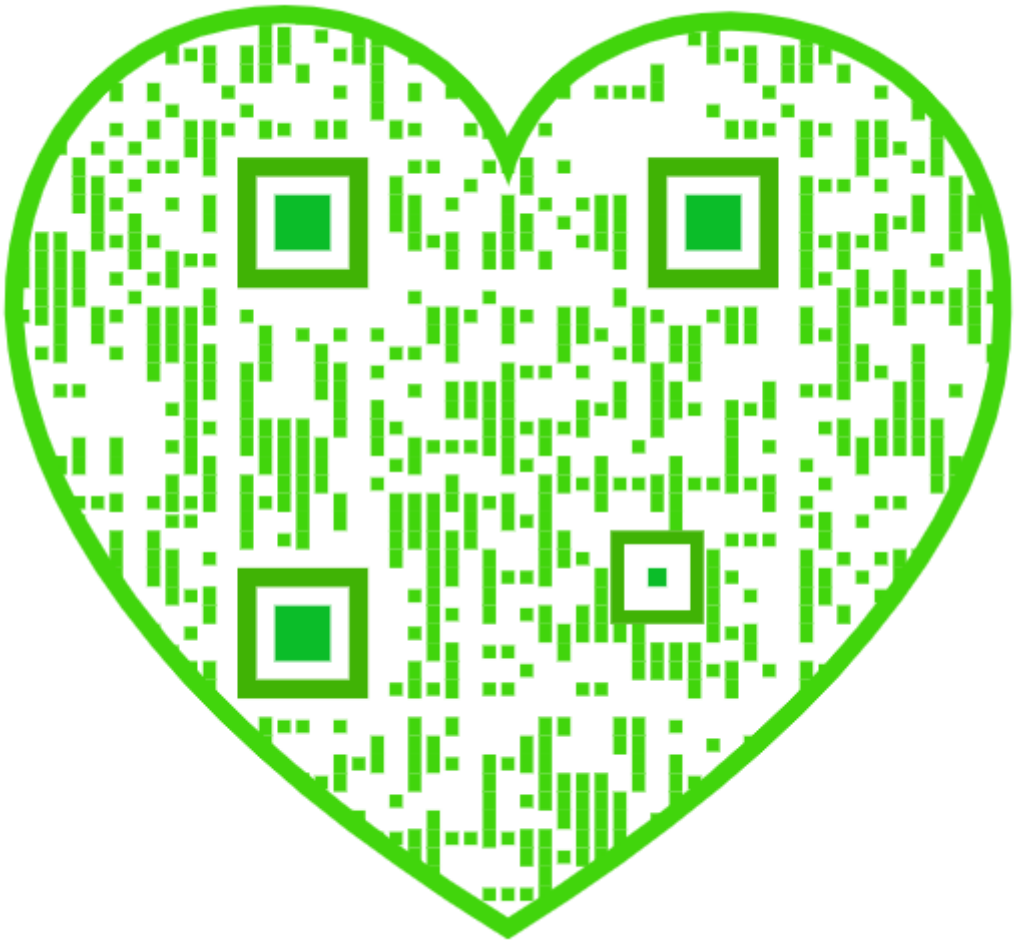

ble. The porous plates are made by maintaining melted lead almost at the point of crystallization and then casting from the semi-crystalline mass blocks forming what may be called "lead sponge." This lead sponge, when sawed into plates of suitable size, forms the most reliable material that has been used in the manufacture of accumulator plates. The plates thus made and prepared are free from most of the defects which are inherent in most paste plates. The lead salts forming the active material, instead of being artificially made and mechanically applied to the plates in the form of paste, are formed chemically as a firmly adherent deposit on the greatly extended surface of the lead crystals and are therefore dispersed throughout the spongy material. When thus formed, it is impossible for the active material to become detached or fall off to any serious degree.

It has been found from actual practice that these plates are not injured by long use, that they have a great capacity of high or low discharge rates, and that they are entirely free from buckling.

The plates now in use at the Edison station have been doing continuous service for more than eight months, having been started in the middle of January. During this time only 21 out of 7,000 plates have had to be replaced.

The watt efficiency of these accumulators is over 86 per cent and their ampere efficiency 95 to 96 per cent. These efficiencies are accurately calculated at the terminals of the battery connections on the switch board.

These cells are the largest in use in this country. We understand that the Crompton-Howell Company make a still larger cell, comprising 154 plates and having a capacity of 3,000 ampere hours.

The battery room at the 53d Street station is located on the top floor, the electrical communications are made through the switch board at the gallery, and the attendant having charge of the gallery manipulates the switches for charging and discharging the accumulators. The switch board is provided with an automatic accumulator switch, which is used with the dynamo charging the accumulators. It is arranged to break the circuit so as to prevent reversal of the current, if from any cause the E.M.F. of the dynamo falls below the prescribed limit.

Besides being provided with the usual well known indicating and recording instruments the switch board is provided with an instrument called the electric clock, the index of which turns in one direction while the accumulator is being charged and in the opposite direction while it is being discharged, thus always indicating the amount of the charge.

We are indebted to Mr. William L. Pakenham, the representative of the Crompton-Howell Company in this country, for information in regard to this new installation.

The Physical Strain Involved in High Speeds.

The exaction that modern railroad speed makes on the physical stamina of railroad men is demonstrated in the fact that seven engineers are required to take the Chicago flier out and seven back, says the *Boston Transcript*. The running time between New York and Chicago is twenty hours and the average speed is forty-eight miles an hour. Each engineer and engine runs three hours. Machine and man return with a slow train to their starting point to relieve the strain on both. Then the engineer is given forty hours' rest before he goes on the flier again. This rest is absolute, no work of any kind being required of the engineer. Though the average speed is forty-eight miles an hour, the locomotive must at some points be driven at sixty or more. The physical strain on the men in the cab at those bursts of speed is something terrible. The engineer has fifty things to look out for, and is being shaken and swayed all the time. The fireman is constantly feeding the insatiate furnace. On the run of the Empire State express three tons of coal are shoveled from the tender into the furnace between New York and Albany. It is not wonderful that the engineers of this train are given alternate days for rest and recuperation. Fast travel not only wears out rails and machines, but human creatures' lives.

A Museum of Natural History for Chicago.

The Art Palace of the Columbian Exposition will be retained as a Museum of Natural History. A process has recently been discovered by means of which the staff covering may be made permanent by the application of a soluble glass paint. The proposed Columbian Museum was made possible by a gift of one million dollars made by Marshall Field, the millionaire merchant. There is material enough in the Fair grounds to start one of the most complete museums ever organized. The ethnological department under Prof. Putnam obtained $200,000 worth of specimens gathered in all parts of the world. This magnificent collection will be presented to the museum and will form the nucleus around which the later additions will be placed. Most of the rare woods in the Forestry building will also be presented to the museum. The new museum will be within easy walking distance of the University of Chicago.

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DEATH BY GAS ASPHYXIATION AND POISONING.

We recently had a case of death from gas asphyxiation brought to our attention by a letter describing the occurrence. The writer first tells of the features of the occurrence. In Corning, Kansas, a well was being bored. The depth was about seventy feet. A rock in the bottom interfered with the operation of the tools. A man undertook to descend the rope. When about fifteen feet from the surface, he dropped from the rope. His companion workman at once started to rescue him and descended the well, naturally supposing that his companion's grasp had failed him. When the second workman reached about the same point, he also fell. Both were ultimately removed dead. A lantern was lowered into the well and was extinguished, also at the fifteen-foot level. The people of the vicinity attributed the accident to fire damp. The real cause was choke damp or carbonic acid gas. Under the circumstances it could not have been the other gas. Our correspondent writes, "Will the SCIENTIFIC AMERICAN explain what the so-called fire damp is and what causes it?"

As we just stated, it was not fire damp. The cause of the presence of carbonic acid gas in the well cannot be stated with certainty. We know that many mineral waters are highly charged with it, so that it may be looked for in any deep excavation. It may have been liberated from some subterranean source of mineral water.

The gas in question is nearly twice as heavy as air. It can be poured from one vessel into another almost like water. Being a gas, it must constantly diffuse through air and air through it when they come together, yet it will lie in an open receptacle for a long time before entirely leaving it. An animal immersed in it dies of suffocation, with possibly a superadded toxic or poisoning action upon the system. A lighted lamp or candle lowered into it is extinguished as if dropped into water. The gas is without odor, so that one may be overcome without the least forewarning.

On November 3, 1886, a remarkable accident in a tunnel at Perkasie, Pa., occurred which illustrates the fearful suddenness of the attack. Some fifty men were working in the interior of a railroad tunnel. A freight engine had become "stalled" near them. A fan blower was set to work to bring up the pressure. The engine then started, and it is supposed acted like a piston, forcing the gas before it, and as the gas was driven on, it reached the place where the men were working; they at once became immersed in the deadly atmosphere. They fell as if dead, some forty of them becoming totally insensible. One man, only partially overcome, succeeded in making his way to the mouth of the tunnel and reported the occurrence. A flat car was at once run in, and was loaded with the bodies, as if with so many logs. All were supposed to be dead, but with the exception of one who had fallen into a pool of water, they eventually recovered. As a curiosity and as illustrating the suddenness of the insensibility, the fact that one man was found hanging head downward to a ladder may be cited.

Carbonic acid gas is to be looked for in confined places, and in beer vats, wells, and similar impervious receptacles. Before entering a suspected locality, a test should be applied by lowering a candle or lamp into the place. If this reaches the bottom unextinguished and burns with undiminished intensity, the vessel or well can be entered without apprehension. A diminished intensity of light indicates danger; total extinction proves that the atmosphere is fatal. To remove the gas strong ventilation may be adopted, but as this is not always practicable, the chemical method may be often used. A quantity of lime is slaked, and then is stirred with water so as to produce milk of lime. This is poured down the sides of the place, is thrown in fine spray down it, and is in any way distributed as thoroughly as possible, so as to act upon the gas. The process is continued until the lamp or candle test shows pure air. If all the lime were effective, one pound would combine with and remove about five cubic feet of carbonic acid gas. The capacity of the space to be freed of gas may be calculated and some basis reached as to the quantity of lime required. Owing to waste, several times the calculated quantity will be generally needed. It is essential that the lime should be freshly slaked.

The action of the lime upon the gas is one of combination. The carbonic acid gas enters into chemical combination with the lime, producing calcium carbonate or chalk. Thus the poison is effectually removed. Air acts by simply washing it out mechanically. The action of lime is altogether chemical.

The operation of air in displacing the gas is available in resuscitating men asphyxiated as spoken of above. In a recent number of this journal a pump for producing artificial respiration and injecting fresh air into the lungs was described. In gas poisoning or asphyxiation such an appliance may be the means of bringing about a speedy return to consciousness and life. The great object is to wash out the gas from the lungs, and this can be thoroughly effected by artificial respiration.

Too great care cannot be exercised in these cases. In many instances several men have been overcome

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in succession, one or more going into the well or vat to rescue a companion whose sudden fall may not have been attributed to carbonic acid gas. It is also a mistake to suppose that the gas can be endured by one anticipating its occurrence, or that escape is certain for such a one. The loss of consciousness comes on so suddenly as to make useless any knowledge or forewarning of the presence of the gas.

The Exposition Medals and Awards.

The design for the medal has been submitted to the Secretary of the Treasury by Aug. St. Gaudens. The medal will be of bronze, three and one-half inches in diameter. On the obverse is a relief figure of Columbus and on the reverse the figure representing Youth. Director Preston, of the mint, thinks it will take three months to finish the work. This will disappoint many firms, who want a copy of it to ornament calendars for 1894.

John Boyd Thacher says the diplomas will be ready to issue in six months; the medals at the same time. The wording of the judge will only be changed as required by the rules of grammar and punctuation and for brevity. The matter to be placed on each diploma is not to exceed 300 words. Mr. Thacher says: "I will publish the names of award winners by classes as soon as possible, probably beginning within two months. The exhibitors whose names are thus published can obtain by letter or otherwise from this department the wording of their awards, although they will not be apt to receive their diplomas until several months later. The wording will be sent by mail to exhibitors or given to some person duly authorized by the exhibitors to apply in person."

Merits of Steam Boilers Used at the Exposition.

The Babcock & Wilcox Boiler Company have published a statement in which they say: "We were informed that it was the purpose of the jury at the Fair to make awards on boilers based entirely upon the written statements of the exhibitors of boilers, without tests or any personal knowledge in the possession of said jury concerning the comparative construction, operation, economy or durability of said boilers. We were asked to make such a statement, and were informed that all other exhibitors of boilers had been requested to make a like statement of their claims for the consideration of the jury of awards. Believing that an award based on such insufficient knowledge on the part of said jury could be of no practical value, and notwithstanding the expense incurred by this company in making an exhibit, we respectfully declined to make any such written statement for the purpose of receiving an award upon our boilers."

Dutch Belted Cattle for Mexico.

Mr. H. B. Richards, who received the first premium for Dutch belted cattle at the Chicago Exposition, informs us that the animal which was illustrated in the SCIENTIFIC AMERICAN a fortnight ago was, with twelve others of the same breed, sold to Senor Jos. De Teresa, a son-in-law of President Diaz, and were shipped to the city of Mexico direct from Chicago. A few days ago the same gentleman visited Mr. Richards' farm, at Easton, Pa., and selected fourteen others out of his herd, making a total of twenty-seven head of Dutch belted stock shipped to Mexico as the result of exhibiting at the Fair.

Things to Hit with a Hoe.

We credited, in our issue of October 14, the unique World's Fair Exhibit of weeds, growing over an old rail fence and labeled, "Things to hit with a hoe," to the Horticultural department. The exhibit was really prepared and entered by the Orange Judd Farmer Company, of Chicago, who spared no expense or trouble to make it a success. The exhibit has received a prize, which was certainly merited by the oddity of the design.

THE Bridgeport Wood Finishing Company has been awarded a medal and four diplomas at the Exposition for their Wheeler Patent Wood Filler and Breinig's Lithogen Silicate Paint. The Connecticut building was painted entirely on the outside with Breinig's Lithogen Silicate Paint. The interior woodwork of the West Virginia and Missouri State buildings was entirely filled with Wheeler's Patent Wood Filler, as were other fine displays of interior woodwork, and all this was in pleasing contrast with the many fine displays of hard woods finished, and on which the varnish has shrunk and pitted. The woods in the Forestry department which attracted so much attention were also filled with Wheeler's Patent Wood Filler.

THE Ingersoll-Sergeant Drill Company has received from the World's Fair judges notice of award of first prize for compound duplex Corliss air compressors, straight line air compressors, Ingersoll-Sergeant rock drills, coal cutter, stone channeling machine, bar channeler, electric battery, and other devices and improvements in machinery for mining, tunneling and quarrying.

Common Sense on Chinese and Other Immigration.

Dr. S. L. Baldwin, in a recent number of the *Independent*, makes the following cogent and sensible remarks:

The bill originally brought in by Mr. Geary from the Committee on Foreign Affairs, February 18, 1892, was properly entitled "A bill to absolutely prohibit the coming of Chinese persons into the United States." It is well known that he grafted as many of the features contained in his original bill as he could upon the bill which was finally passed, and the object of which, whatever professions are made, is to exclude as far as possible Chinese laborers from the United States. That the registration feature of the bill was intended to be oppressive to the Chinese, and was an insult to the Chinese nation in its very terms, was sufficiently manifested at the time of the passage of the bill in a speech by the Hon. R. R. Hitt, who said:

"It compels every man in this country who is a Chinese laborer to go to the Collector of Internal Revenue, prove his title to remain in the country, and apply for a certificate, a pass, a sort of ticket of leave. To obtain it he must himself prove his whole case. He is assumed to be not entitled to it. The burden of proof is all upon him. The rule of all free countries and all civil laws is reversed. He must prove residence here through a long series of years, back to the date of enactment of the whole series of stringent laws, since the treaty of 1880. He must find the witnesses in different places where he may have worked or resided, and one witness must be a white man.

"Every one can understand how difficult, how almost impossible, it is to make out such a long and costly line of proof, especially to a laboring man. This he must prove affirmatively, or he cannot get a certificate. If he is not granted a certificate--and we can readily see how officers on the Pacific coast would be glad to refuse it—he is arrested, imprisoned six months or less, and then expelled from the country. If he obtain it, he must carry it around with him, or be liable, instantly and always, to arrest, imprisonment and deportation, like a convict. It is proposed to have a hundred thousand, or some gentlemen assert two hundred thousand, men in our country, ticketed, tagged, almost branded—the old slavery days returned. Never before in a free country was there such a system of tagging a man like a dog, to be caught by the police, and examined, and if his tag or collar is not all right, taken to the pound or drowned or shot. Never before was it applied by a free people to a human being, with the exception (which we can never refer to with pride) of the sad days of slavery, and the ticket of leave given to convicts allowed to go out a while from the penitentiary, and the convicts at Botany Bay, who had a ticket of leave. But here are more than a hundred thousand men, innocent of offense, who must obtain this certificate, this ticket of leave, and carry it around with them in a free country."

The plea made on behalf of this legislation is that it is necessary in order to prevent the illegal incoming of large numbers of Chinese; but the absurdity of this plea has been demonstrated every time a census has been taken. Every census of the United States shows that there has been no such increase in the number of Chinese in this country as there must have been if these pleas had any truth in them whatever. The fact is that the number of Chinese smuggled into the United States is so small as to be of no account in a great country like this. Besides, back of all this is the fact that there never has been any sufficient reason whatever for this legislation from the beginning until now. We have heard, over and over again, of the millions of Chinese laborers that would be pouring in upon us, of the great damage to the laboring interests of the country, especially on the Pacific coast, and much other talk of the sort. The statistics, however, show that there have never been more than one hundred and twenty thousand Chinese in the country. When the first restrictive act was passed, there had been an increase of only about ten thousand in the ten years preceding, and nearly as many were returning to China as were arriving by the steamers at that time. During the whole period there never has been any such thing as cheap labor on the Pacific coast; and during the whole time higher rates of labor have been paid on the Pacific coast than elsewhere in the country. It is pitiful to see a great nation like the United States scared over a hundred thousand Chinese, while it takes no alarm over the many hundreds of thousands of law-defying immigrants from Europe. It is time that a little common sense statemanship should be used in regard to this whole matter of immigration. It would be perfectly feasible to dismiss the Chinese question altogether by passing a just and uniform law, applicable to all people. There are various measures that might be taken for the proper and healthful restriction of immigration. I will suggest some of these:

First, let the number of immigrants which any vessel may bring to this country be strictly limited—say to one hundred, or even to fifty—for a time, if this be deemed advisable.

Second, require of every intending immigrant that he shall go to the American consul of the port from which he proposes to take his departure, and produce evidence of his good moral character, and his purpose to become a law-abiding resident of the United States, and let no immigrant be admitted from any country without a certificate of these facts from the United States consul of the port from which he sails.

Third, if it be deemed necessary, let a head tax be imposed upon every immigrant, and let it be of a sufficient amount to give some surety that the person shall be a self-supporting inhabitant of this country.

If along all these lines a general law of immigration were adopted, every special enactment with regard to the Chinese might at once be blotted from the statutes, and further disgrace and perfidy in the violation of treaties be prevented. The Chinese would not complain of any law which was thus universally applicable. They have a just right to complain of all laws that single them out for special oppressive legislation which is not applied to the people of any other country. There certainly ought to be in both Houses of Congress some leaders who will bring the nation to a decision in this matter which common sense and humanity can indorse.

Combined Toning and Fixing Bath.

Gaedicke states that a carefully washed collodiochloride print was dusted in one place with pure silver sulphide and in another place with precipitated sulphur, and the whole exposed to the action of air and light. The silver sulphide had no action on the image, while the sulphur ate the image right away. The two ingredients of the combined bath which are hurtful are citric acid and alum; sulphocyanides are not so easily decomposed as hypo., and as they form permanent gold salts they may be used. Lead in a combined bath has merely a physical and not a chemical action; causing rapid precipitation of the chloride of silver, they improve the tones without entering into the image. Gaedicke strongly recommends boric acid and the following particular formula:

Distilled water	1,000 parts.
Sodium hyposulphite	200 "
Boric acid	30 "
Lead nitrate (dissolved in water)	15 "
Ammonium sulphocyanide	20 "
Sol. chloride of gold (1 per cent)	60 "

Black sulphide of lead is precipitated in twenty-four hours, and the bath is then ready for use. The clear solution is absolutely without smell, and by continued use only innocuous silver sulphide is deposited. When fresh, it tones very quickly, and it is advisable to use some of the bath up and add fresh water to it. It is important that the paper, which is always acid, should be well washed and neutralized; the prints should be freed from soluble silver salts, then placed in 1 per cent solution of ammonia. Care must be taken in washing several prints that the whole of the ammonia is not neutralized; there should always be a faint smell. Sodium carbonate may be used in moderation for the same purpose; the prints can then be washed twice in water and then toned. The prints should be taken out of the bath while still rather redder than desirable, because they turn color in drying. —*Photo-Wochenbl.*

A Great French Telescope.

A great refractor is just finished and placed in position for Dr. Janssen at Meudon. It is a combined photographic and visual telescope. The two lenses were made by the celebrated Henry Brothers, of the Paris Observatory. The mounting is by Gauthier, of Paris. Both lenses will be mounted in the same tube, which is *square* and of steel. The visual objective is 82 cm. (32·3 English inches) in diameter, while the photographic objective is 63 cm. (24·8 English inches) diameter. Both lenses are of the same focal length, 17 meters (669 English inches). The large objective will be the guiding part of the instrument when used for photography. This great telescope is housed in the ruins of the old royal palace, a part of the ruins serving as the tower for the great dome, which dome is 20 meters (66 English feet) in diameter and weighs some 60 or 80 tons. The dome is to be moved by a gas engine of 12 horse power. The observing chair is attached to the dome and moves with it. All the fine circles are to be read from the eye end by means of electric lights, the electricity for which is generated by an 8 horse power engine half a mile distant, in what was formerly the royal stables.

New Process for Enameling.

Fletcher, Russell & Co., London, have introduced a new process to supersede the use of Berlin black and black lead for protecting cast iron. The casting is coated with a film of enamel, which is so thin that even the finest details on the metal are preserved. This enamel is said to be absolutely proof against rust, and preserves its qualities at any temperature up to a bright red heat. All colors are obtainable, including gold and silver, bright or dull, and as many as are wished can be produced on one casting. The process is said to offer great facilities for decorative work of all kinds.

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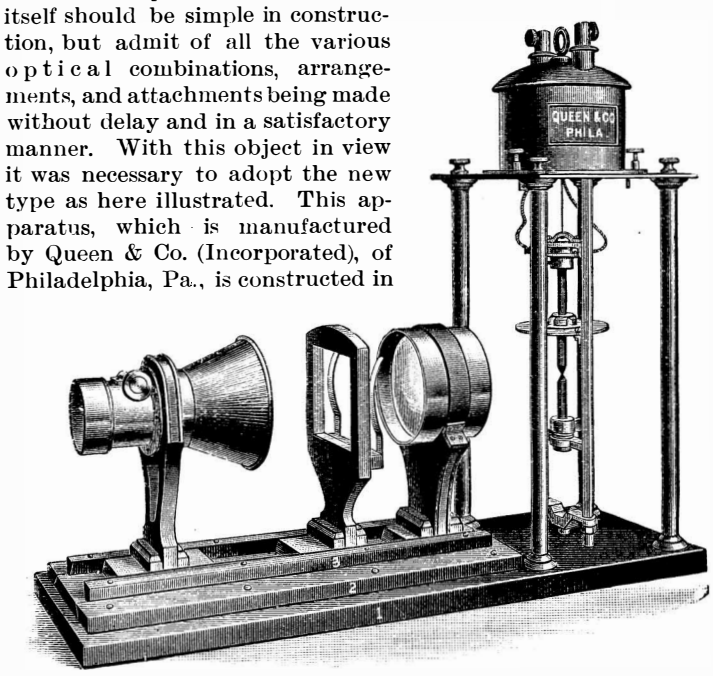
THE "PARAGON" PROJECTION LANTERN.

It is usually claimed for most projecting lanterns that they are suitable for educational purposes, and so far as the ordinary projection of diagrams and pictures are concerned, this may be the case to some extent.

That is, however, only a small part of the work that is expected to be performed with the educational projector; for the illustration of physical laws, for the performance of chemical experiments and for the projection of microscopic specimens; special facilities must be offered for each of these branches, the projector must be furnished with accessories and adjustments which shall enable an experienced lecturer to obtain the most complete results in all cases. The projector itself should be simple in construction, but admit of all the various optical combinations, arrangements, and attachments being made without delay and in a satisfactory manner. With this object in view it was necessary to adopt the new type as here illustrated. This apparatus, which is manufactured by Queen & Co. (Incorporated), of Philadelphia, Pa., is constructed in



THE "PARAGON" PROJECTION LANTERN.

two parts: the lamp and stand for the electric light, and an optical bench with sliding bases and standards which support the optical and other apparatus. So simple is this plan in its operation that the accessories can be exchanged in a few minutes, as, for instance, the vertical prism can be located on the base or taken off for the microscope to take its place, and so forth, with the absolute certainty that all parts required in the exhibition are perfectly in the optical center. A few of the more important accessories will here be described:

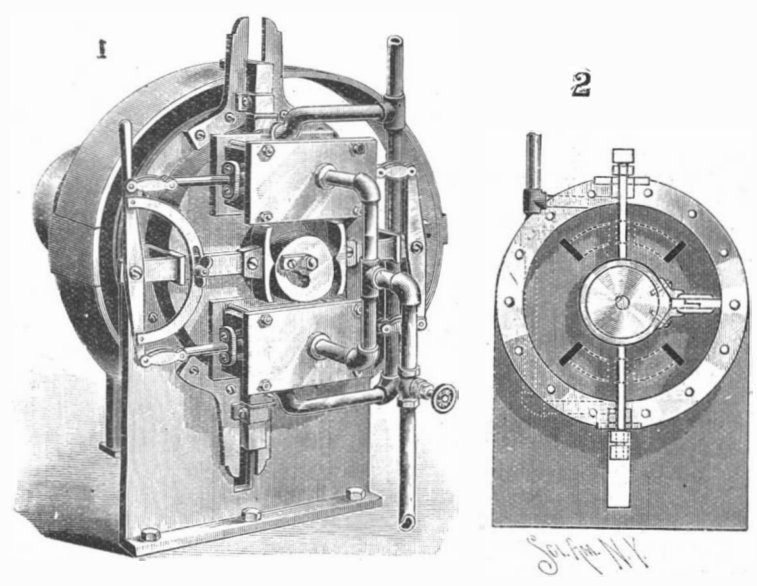
The vertical attachment is constructed with a plane reflector, condensing lens, upright stem with arm to carry the objective and right-angled prism. This apparatus is indispensable for the display of many physical and chemical experiments.

The microscope requires certain arrangements to bring a full course of light with as little heat as possible to the object to be exhibited. The distinguishing feature of this projection microscope is found in the application of an achromatic negative lens to convert the converging rays coming through the condensing lens into a cylinder passing to the secondary condenser; these are provided with rack and pinion, so that the illumination of the object can be adjusted with great nicety. Not only is the silvery whiteness of the arc light a great advantage, but as the radiant is comparatively a point, the definition given by a good objective is superb. Abundant light is at hand for obtaining a power of 1,000 to 3,000 diameters with perfect definition; a flea may be enlarged to fifteen feet in length.

The polariscope can be constructed in several ways. The refracting polariscope is composed of two Nicol prisms, one being used as a polarizer, the other as an analyzer; or a bundle of glass plates for a polarizer and a Nicol prism for an analyzer.

The reflecting polariscope is, however, more effective. It has two reflecting surfaces for the polarizer and a Nicol prism for the analyzer. The performance is perfect. All three of the above polariscopes are direct acting. The stage, or object holder, is furnished with a rotating plate in front and a separate slip holder back to facilitate the performance of plane and circular polarization.

The arc lamp employed is a very fine illustration of accurate workmanship, neat in appearance and perfect in its performance. Not only does it maintain a steady silvery white light, but it also automatically holds its position in the exact optical center until the carbons are finished.



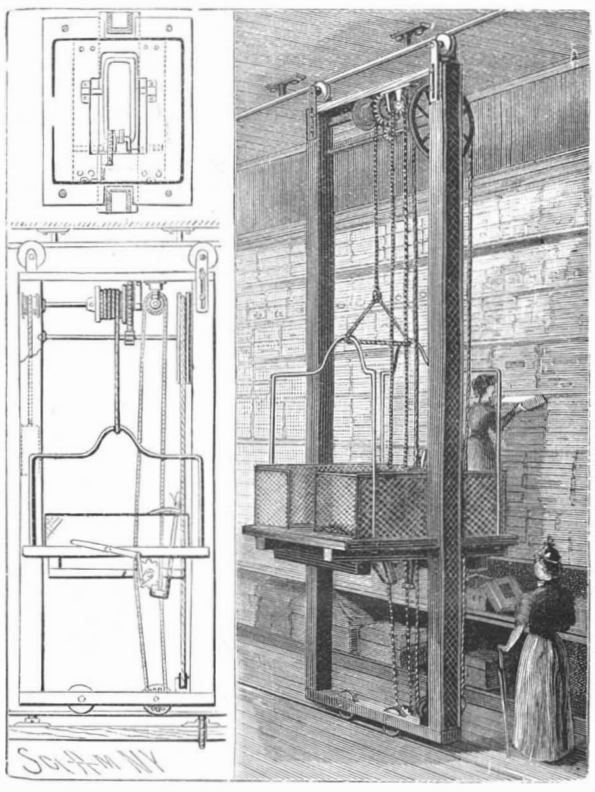
GOULD'S ROTARY ENGINE.

AN IMPROVED ROTARY ENGINE.

In this engine, which has been patented by Mr. O. O. Gould, of Copemish, Manistee County, Mich., the cylinder is preferably made in two parts bolted together and rigidly supported on a frame attached to a suitable foundation. Fig. 1 is a side view of the engine, Fig. 2 being an interior view of one-half of the cylinder. In the central bore of the cylinder are heads in which is journaled the main driving shaft, on which is a central disk supporting a piston, as shown in Fig. 2, the piston having suitable overlapping and spring-pressed packing plates engaging the sides and inner cylindrical surface of the rim of the cylinder. In suitable guideways arranged in the sides of the cylinder two opposite gates or abutments are mounted to slide radially, the outer ends of the gates having slotted heads engaging the continuous rim of a cam secured on the main driving shaft, so that the revolution of the latter causes the inward and outward sliding of the gates. The guideways in which the guides of the gates slide form part of the main frame, and the cam is so arranged that during one-half of the revolution one gate remains stationary in an innermost position, while the other gate is moved outward and back again. The two steam chests on the front of the cylinder, connected by pipes with a suitable source of steam supply and pipes to carry off the exhaust, are provided with slide valves, each having on its under side two cavities. These valves operate over the four elongated ports of the interior of the cylinder, as shown in Fig. 2, two of the ports being arranged diametrically opposite two other ports, and on opposite sides of a sliding gate. The valves also operate over exhaust ports midway between the live steam ports. The stems of the valves are connected by links at their right-hand ends with a lever centrally fulcrumed on a slide, and at their other ends with another similarly fulcrumed lever, which is also a hand lever. On the latter lever is a segment with segmental slot engaged by a bolt on the slide, so that when the nut of the bolt is loosened the lever may be moved to change the position of the valves and reverse the engine. A cam held loosely on the driving shaft, and carried around by a pin in a segmental slot of the cam, engages oppositely located arms on the slide to give to the latter a sliding movement, the arrangement permitting of changing the position of the slide when reversing the engine without disturbing other parts. Part of the peripheral edge of the cam is concentric, so that the valves are held stationary during part of a revolution of the shaft, and when in their outermost position in the steam chests, but each full revolution of the shaft imparts a full stroke to the right and to the left to each of the valves.

A MOVABLE ELEVATOR FOR USE ON STORE FLOORS.

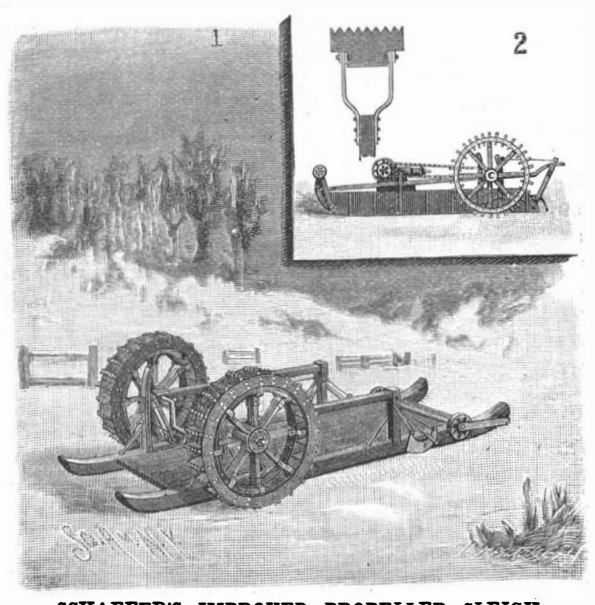
This elevator, adapted for use on one floor only of a building, and which may be readily moved to various positions, enabling articles at different elevations to be reached, has been patented by Mr. Robert W. Parmenter, of Yutan, Neb. The small figures represent sectional side and plan views of the improvement, the operation of which is shown in the large view. The upright posts of the frame are hollow, one side covered by screening, and adapted to carry a counterbalance. Rubber-lined, grooved wheels, journaled at the top and bottom of the frame, run upon parallel tracks on the floor and ceiling, the floor track being mounted on screws projecting through floor plates, whereby the height of the lower track may be regulated to cause the wheels to fit snugly at the top and bottom. The elevator car is suspended by bails to which is attached the hoisting cable, extending over a drum carried by a shaft journaled in the upper portion of the frame, there being on one end of the shaft a pulley to which is secured a cable by which a counterbalance weight is suspended to move up and down in one of the posts whereby the car is balanced. The shaft at the top has a gear wheel engaged by a pinion on a lower shaft carrying at one end a pulley, over which, and over pulleys at the bottom of the frame, passes an endless rope, by pulling on which the occupant may raise and lower the car. The lower pulleys are journaled in vertically adjustable supports, whereby the tension of the rope may be regulated. On the shaft with one of the driving wheels at the bottom of the frame is also a sprocket wheel, in line with a similar wheel in a vertically adjustable hanger at the top of the frame, and the sprocket chain by which these wheels are connected engages also a sprocket wheel on a crank shaft journaled in the car. The crank is connected by a pitman with a treadle, the working of which operates the sprocket chain and revolves one of the driving wheels at the bottom to propel the entire structure along the track. By a lever carrying a clutch, and journaled in the floor of the car, the upper end of the lever swinging opposite a notched quadrant and having a retaining latch, the sprocket chain may be held in such engagement with the sprocket wheel that the elevator will be locked in a stationary position, or so that the chain may be operated by the treadle to propel the elevator. The mechanism is such that the elevator may be easily propelled and perfectly controlled.



PARMENTER'S ELEVATOR.

AN IMPROVED PROPELLER SLEIGH.

A sleigh designed to be readily propelled and steered over ice and snow, either by the occupant or by a suitable motor, is shown in the illustration, and forms the subject of two patents recently issued to Mr. Friederich A. Schaefer, of Truckee, Cal. On bearings which permit of vertical adjustment at each side of the sleigh are journaled short shafts carrying paddle wheels of novel construction, adapted to engage the snow or ice to propel the sleigh forward or to steer it. The shafts may have suitable crank arms, for propelling the sleigh by hand, or they may be connected by pitmen with a motor, and the paddle wheels have spokes, each having its outer end forked, as shown in Fig. 2, the transversely extending paddles being made of sheet



SCHAEFER'S IMPROVED PROPELLER SLEIGH.

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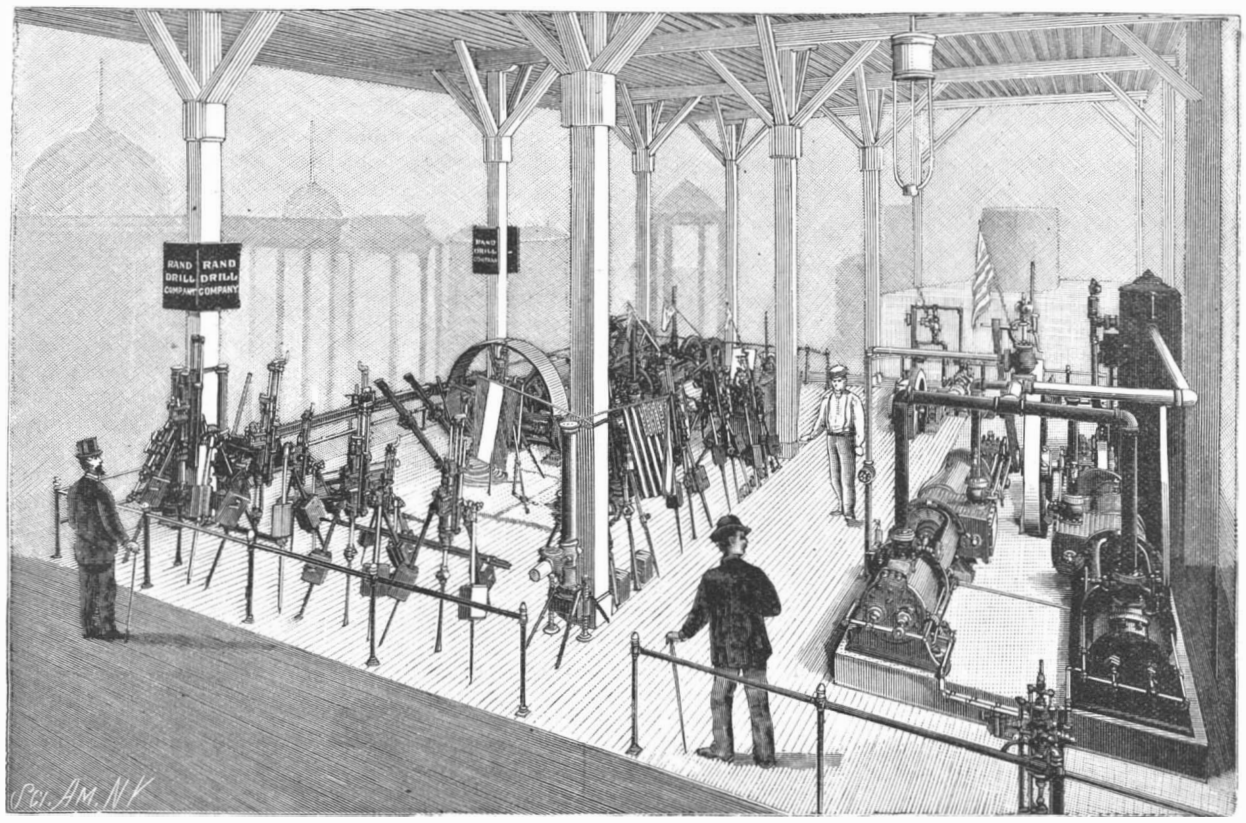
metal, with their outer edges serrated. Near the forward end of the sleigh, on each opposite side, is a curved rudder held normally out of the snow by a spring, but by pulling on a rearwardly extending cord a downward swinging motion is given to one of the rudders to move its rear curved end into contact with the snow or ice, to steer the sleigh to the right or left as desired. To conveniently pass the sleigh over ground a pair of front wheels is provided, their axles journaled in pivoted side arms and locked in place by a pin, the arms being swung downward when it is desired to wheel the sleigh over the ground, the paddle wheels being at the same time locked in their lowermost position, whereby the sleigh is lifted entirely off the ground. When the snow or ice is again reached, the arms carrying the front wheels are swung into their upper position and the paddle wheels are raised to the height best adapted to effectively engage the surface of the ice and snow. The invention also provides for the convenient and ready attachment to the main runners of different forms of auxiliary runners specially adapted for running over ice or hard frozen ground or loose or wet snow.



THE RAND DRILL COMPANY'S EXHIBIT AT THE COLUMBIAN EXPOSITION.

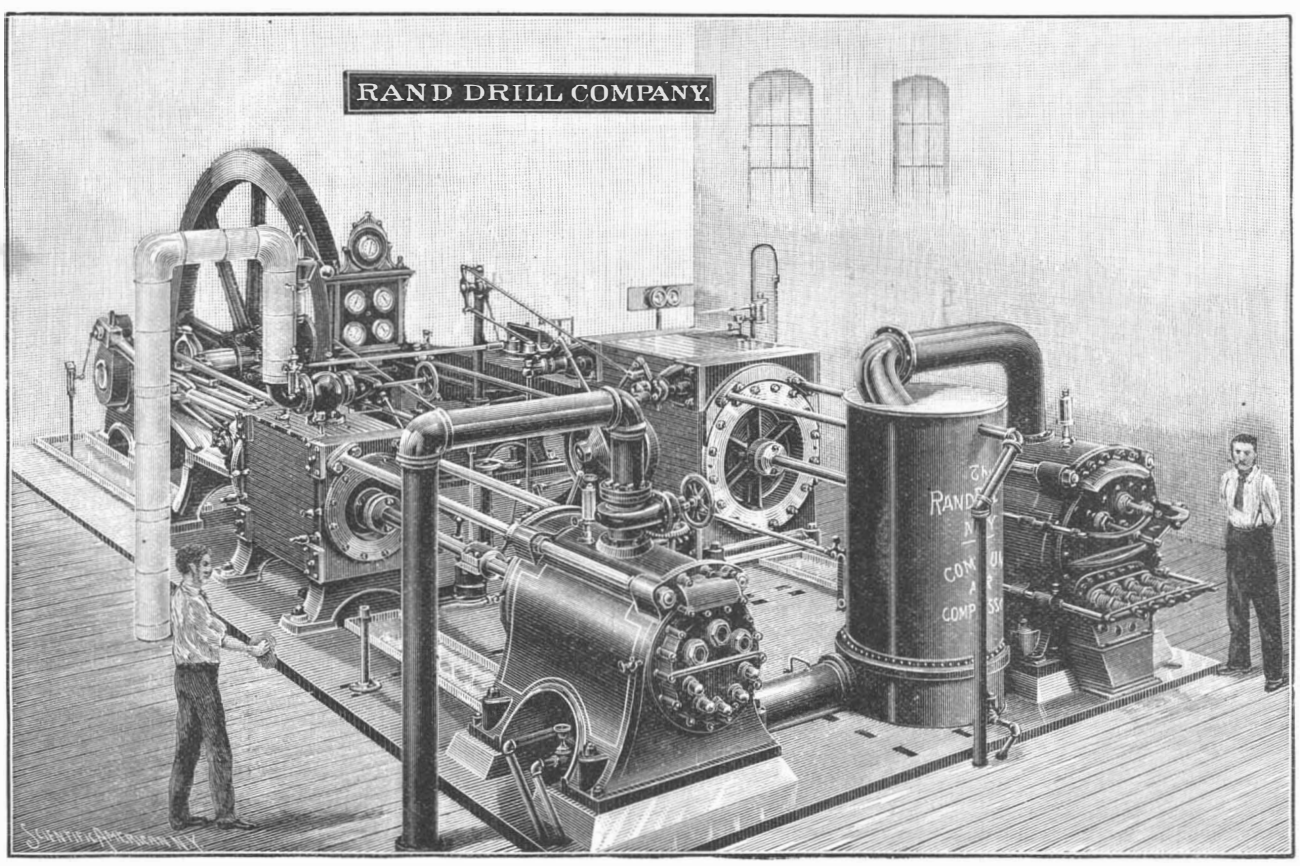
THE RAND DRILL COMPANY'S COMPOUND DUPLEX AIR COMPRESSOR AND ROCK DRILLS AT THE COLUMBIAN EXPOSITION.

Formerly, when the applications of compressed air were more or less tentative, and the whole system was little more than experimental, engines of a comparatively cheap type were naturally employed for driving the compressors, at the expense of course of economy of fuel. With the rapid development of recent years in the various uses of compressed air, the point was reached where users began to inquire carefully into the cost of production and a demand arose for compressors embodying the highest and most advanced construction, both as regards the compressors themselves and the engines for driving them.

The Rand Drill Company, of 23 Park Place, New York City, have been pioneers in meeting this demand for machinery of the most advanced type. An example of their latest construction was shown in their conspicuous exhibit in Machinery Hall at the Columbian Exposition. This machine, which is here illustrated, is the largest and most highly organized of any exhibited at the Fair. It has, in consequence, attracted a great deal of attention. It was driven by a Corliss engine of the cross compound condensing type. The air cylinders are compounded, in order to make the compression in two stages, and between the two cylinders is an intercooler through which the air must pass in its progress from the low pressure to the high pressure cylinder. This intercooler has a function analogous to the intermediate receiver of compound steam engines, but in addition to that, it has a more important function, which is the chief reason for the compound system as a whole, viz., the cooling of the air at the middle of its compression. As is well known, the compression of air develops a large amount of heat, which by expanding the air consumes a portion of the power which is subsequently lost, in consequence of the air becoming cooled before use. The purpose of the compound system is to diminish this loss by taking the air from the first cylinder when partly compressed, and hence heated to a moderate degree only, and cooling the same down to its original temperature by means of a water jacket, after which it is discharged into the second cylinder and the compression completed. There are thus two stages of compression, the second of which is begun with cold air, whereas in the usual single cylinder system the compression is continuous, the latter half being done on air already heated during the first half.

If the indicator cards from the two cylinders be combined in the manner common with compound steam engines, the result would be to show a break in the compression line, that portion which represents the completion of the compression being set back nearer the end of the card, the results indicating a considerable saving in power.

The air end of this machine is fitted with the Rand Drill Company's well known mechanically moved air valves, which constitute a marked advance on the regulation spring valves heretofore almost exclusively used. The mechanical attachment to these valves operates upon the springs with which the valves are fitted. The ordinary style of compressor vaive is in principle the same as the valves of pumps, being opened by the pressure of the air and closed by springs which constantly press upon their backs. In use, such valves, as is well known, have a chattering action due to the constant conflict between the air which is trying to open them and the springs which try to close them. The action of the mechanical gear is to retract the pressure of the springs from the valves, during the period when the valves are required to be open, thus leaving the valves under the influence of the air only and doing away with the chattering. The final result, however, is much more far reaching than this description would at first indicate. The chattering of the valves necessitates a small lift, in order to limit the violence of the action, and this, by reason of the accompanying small opening, necessitates a large number of valves to give the required total opening. With large compressors this multiplicity of valves becomes formidable and complicated. The action of the mechanical gear stops the chattering, as before mentioned, and the necessity for a small lift no longer remains. Consequently, the valves are given a high lift, so as to give a free and unobstructed opening, and the total number of valves is, consequently, very largely reduced. The machine is also fitted with the Rand Drill Company's differential pressure regulator, the operation of which attracts the attention of the mechanical eye. This regulator operates upon the knock-off blocks of the Corliss gear, much after the manner of the usual ball governor, with which the compressor is also supplied, and it is the combination of these two governors acting upon the same set of knock-off blocks which forms the interesting feature referred to. When the machine is started without pressure in the air pipes, the throttle valve is thrown wide open, and the machine runs up to the highest limit of its speed until checked and controlled by the ball governor, after the manner of ordinary Corliss engines for motive power. As the pressure rises, it soon reaches a point to which the plunger of the regulator is loaded; this plunger then rising shortens the cut-off and slackens the speed, when the ball governor drops, and the compressor remains under the control of the pressure regulator, which shortens or lengthens the cut-off as may be necessary to give the speed which shall maintain the air pressure, any drop of pressure being accompanied by an increase of speed and any rise of pressure with a diminution of speed. Should, however, the demand for air exceed the capacity of the machine, the pressure will drop below that to which the regulator is set, when it will go out of action, and the speed will increase until the ball governor acts as at the start. At times, when the demand for air approximates the capacity of the machine, this interchange of action between the two regulators is constantly taking place.



THE RAND COMPOUND DUPLEX AIR COMPRESSOR AT THE COLUMBIAN EXPOSITION.

The diameters of the air cylinders of this machine are 22 inches and 34 inches, and the diameters of the steam cylinders 22 and 40 inches, while the stroke of 48 inches is common to all.

The Rand rock drills formed a noticeable feature at the Exhibition. There were shown drills for every variety of work, including mining, quarrying, sub-

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marine work. A long experience has enabled the Rand Drill Company to bring these drills to such a state of perfection as to perfectly adapt them to the wide range of uses to which they are applied and to give them the qualities of durability and efficiency which are so essential to machines subjected to rough usage and trying conditions.

Enlarged Stereoscopic Pictures.

The following description of Mr. John Anderton's system for obtaining stereoscopic effect on the lantern screen is given in the *British Journal of Photography:*

"In adapting the stereoscope to the optical lantern, the problem to be solved is, to place upon the screen a pair of ordinary stereoscopic pictures in such a manner that, while the right eye can only see the right hand picture and the left eye the left hand picture, yet the two are combined and conveyed to the brain as one.

"In the invention this problem is solved in an exceedingly simple manner. The pictures on the screen are in full perspective, the various objects forming them standing out as if possessed of three dimensions, and appearing in their correct relative planes. A pair of ordinary stereoscopic transparencies are superposed on the screen as nearly as possible; the pictures not being identical, a perfect registration cannot be obtained. The light from each picture is polarized, one vertically, the other horizontally, and the combined picture is viewed through an analyzer similar to a small opera-glass. This analyzer is so constructed that, while the right eye can only see the image portrayed in horizontally polarized light, the left eye can only see that in vertically polarized light. An important part of the invention is the screen. It is a well known fact that polarized light is apt to be broken up on reflection. The screen employed is faced with dull or matt silver, a long series of experiments having proved this to be the best material."

To this descriptive outline, which is in the nature of a "popular" one, it is only necessary to add that the superposition of the stereoscopic picture is effected by halving the transparency and projecting the halves by means of an ordinary biunial lantern. The polarizers are placed before each objective.

We may at once say that for our own part we consider stereoscopic projection, as worked out by Mr. Anderton, and shown recently, as perfectly successful. Indeed, our expectations never went within measurable distance of what we then realized.

The two pictures, when superposed, show a duplication of outline, due, of course, to the fact that absolute registration of the two dissimilar halves cannot be got. When looked at through the analyzer, however, the blur disappears, the image coalesces in the brain just as when a binocular slide is examined in the stereoscope, and the screen picture becomes at once well defined and truly stereoscopic, objects standing out in apparent relief and solidity with all the charm of reality.

It should be said that, while all the pictures shown yielded stereoscopic effect when viewed through the analyzer, some were less successful than others. Interiors, flowers, landscapes, animals, were shown, perhaps the most realistic being the picture of a tiger in a cage, the paws of the animal reaching, as it were, out of the picture, the bars of the cage separating from the animal beyond them, and the whole effect being remarkably good.

It is claimed that any subject taken with a binocular camera would be suitable for stereoscopic projection, but we are disposed to think that successful effects, not only to a popular audience, but to those not unfamiliar with stereoscopic photography, would be best obtainable by suiting the treatment of the subject to the conditions of the case. Thus, it appeared to us that the most successful pictures shown were those which had been taken with short focus lenses separated rather above the distance which strict theory demands, so as to obtain some little exaggeration of relief. This, however, is only a reflection in passing.

On the whole, Mr. Anderton is to be congratulated upon the undoubted success of his adaptation of certain optical principles to stereoscopic projection. The lantern stereoscope should be widely popular.

The Cost of Carelessness.

Familiarity with danger seems to breed, if not a contempt for it, an utter carelessness. We have seen, says the Chattanooga *Tradesman*, the "Mohawk Dutchman," the celebrated expert with a band scroll saw, rub the ball of his thumb in dirty grease and then cut the grease off with the rapidly running saw as clean as could be done with soap and water. We have seen a man put his finger under a powerful trip hammer in motion just to show how well he could manage the machine. Many other foolish things are done just to "show off." But most of the accidents happen through a carelessness resulting from familiarity. As long as an operator is afraid of his machine, he is not apt to get hurt. Many human minds are so constituted that they cannot bear a sustained effort in one direction; that is, cannot be always equally on the alert in regard to a certain contingency. A train dispatcher or switch tender may hold a place for years without ever making a mistake, and at last make a terrible one, from some cause he could not explain. The only way to lessen the number of casualties—they cannot be avoided entirely—is to take all precautions. This is required of the owners if they wish to escape costly damage suits, but when all possible precautions have been taken, one can then only trust to luck.

THE SCIENTIFIC AMERICAN MATCH SAFE.

The readers of the SCIENTIFIC AMERICAN will be interested in the accompanying cut, which represents,

THE SCIENTIFIC AMERICAN MATCH SAFE.

not a copy of the paper, but a silver match safe, which is manufactured in facsimile of the SCIENTIFIC AMERICAN, and represents it as folded in a wrapper and as having passed through the mail. The familiar blue one cent stamp is in one corner and canceled by the New York postmark. The name of the owner may be enameled upon the wrapper and the autograph accurately reproduced. The manufacturers, Messrs. Enos Richardson & Co., of 23 Maiden Lane, New York, have paid us the compliment of selecting the SCIENTIFIC AMERICAN as the most representative and available paper for this purpose, and we take pleasure in acknowledging their courtesy and discrimination.

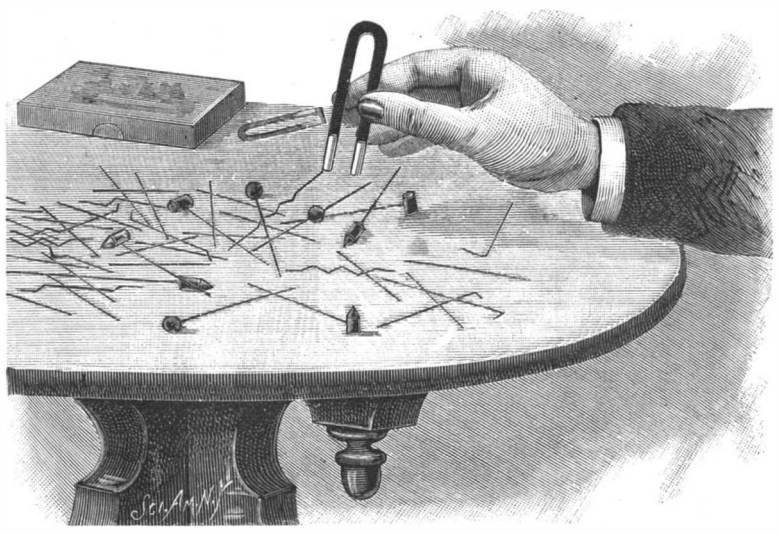
MAGNETIC JACK STRAWS.

The illustration below shows one of the most ingenious devices for the amusement of children to be found this season among the various toy stores and elsewhere.

It is a game that will not only amuse children, but affords an endless source of amusement to adults as well, and can be played by any number of persons.

The game is put up in a neat little box, and contains a large number of metal straws of various colors, crooked, and angled, and crimped, and some of them having little heads of colored wood in various forms, together with two magnets.

The object of the game is to withdraw a single straw from the bunch by means of a magnet and without touching or disturbing the other straws. The game is manufactured by E. I. Horsman, of 341 Broadway, N. Y.



MAGNETIC JACK STRAWS.

The Simplon Tunnel.

It is announced from Berne that the contract for boring a tunnel through the Simplon has just been signed and has been given by the Jura-Simplon Railway Company to Messrs. Brand, Brandau & Co., of Hamburg, and Locher & Co., of Zurich. Both these firms have some experience in mountain railway work, the former having joined in the boring of the Arlberg tunnel and the latter having constructed the line up the Pilatus. The Mont Cenis tunnel, the first of the Alpine tunnels constructed, took 13 years in its completion; the first blast (at that time the only method known for boring tunnels) was made with gunpowder in 1857, and it was not till four years later that machine drilling was introduced, while the subsequent application of compressed air drills came almost too late for the engineers to profit fully by them. The average rate of advance during the thirteen years' work was 2·57 lineal yards per working day of 10 hours, each lineal yard costing £226. In boring the St. Gothard tunnel the engineers could profit by past experience; it was commenced in 1872, and, though two miles longer than the Mont Cenis tunnel, was finished in 1881. Turbines of 2,000 horse power compressed the air for working the Ferroux drills, and the rate of advance was 6·61 lineal yards per day, at a cost of £143 per yard. Further advance was made in the boring of the Arlberg tunnel, which is 6½ miles in length, and took only three years to construct. In this case the average rate of advance was 9·07 yards per day, at a cost of only £108 per yard. We have no doubt that a further advance will be made in the boring of the fourth of the Alpine tunnels, and we hope that this advance will be due to electrical methods. We have now at our command most efficient electrical drills and can work these drills by electromotors. Motive power in mountainous regions can easily be derived from some of the numerous waterfalls to be met with in these regions, and the locality of the central stations, thanks to the progress of electrical power transmission, can, within the prevailing limits, be pretty nearly chosen at will. We feel sure that the enormous advantages of an electric installation will not be overlooked by the contractors, and in this case the stipulated time for the completion of the work of 5½ years will prove more than ample. It is contemplated to construct at first only a single line of rails; a gallery, however, will be made at the same time, and will afterward be widened to enable a second line of rails to be constructed after four more years. The cost is estimated for the first enterprise at fifty-four and a half million francs (£2,180,000), and for the addition, fifteen million francs extra.—*Electricity.*

The Year's Progress in Naval Ordnance and Armor.

The annual report of the Chief of the Navy Bureau of Ordnance gives a good summary of the year's work in the bureau, as well as an estimate for the next fiscal year, which is $7,145,801, of which $6,500,000 is for arming vessels already authorized. Of 453 guns of calibers from four to thirteen inches which have been ordered, 298 are completed, including twenty-five 10 inch, eight 12 inch and five 13 inch; 188 are afloat; and forgings for 368 guns have been delivered. The 13 inch guns have not been tested as yet, owing to delays in mounting. Progress is being made on 8 inch nickel-steel guns and on the Hurst 8 inch guns. Cartridges will hereafter be supplied for the 6 inch guns. Of the small guns for the secondary batteries, 480 Hotchkiss and Driggs guns, 360 are finished. Two hundred and thirty-seven gun mounts have also been completed.

Smokeless powder is not yet suitable for regular use, but large quantities of brown powder are supplied by the California Powder Company, of Santa Cruz, and by Du Pont & Co., who have also supplied 50,000 pounds of gun cotton. The treatment of small caliber projectiles by the Harvey process has proved very satisfactory. Experiments are being conducted in firing shells from high-power guns charged with gun cotton and fulminate.

Contracts for 6,489 tons of armor have been made during the year and the plants have been enlarged to admit of delivering the armor more rapidly. By the new arrangements armor can be supplied as fast as needed to the vessels in the shipyards. The armor, both the nickel-steel and the Harveyized, continues excellent in quality. A number of new Howell and Whitehead torpedoes have been received. The difficulty with the main valve of the pneumatic guns of the Vesuvius has not been overcome and Commodore Sampson recommends that the $450,000 appropriated for a similar vessel be used to build four torpedo boats instead. The report shows that the Bureau of Ordnance is making substantial progress.

Edison on Flying Machines.

Once I placed an aerial motor on a pair of Fairbanks scales and set it going, says Thomas A. Edison. It lightened the scales, but it didn't fly. Another time I rigged up an umbrella-like disk of shutters and connected it with a rapid piston in a perpendicular cylinder. These shutters would open and shut. If I could have got sufficient speed, say a mile a second, the inertia or resistance of the air would have been as great as steel, and the quick operation of these shutters would have driven the machine, but I couldn't get the speed. I believe that before the air ship men succeed they will have to do away with the buoyancy chamber.

A ROCHESTER man has devised a plan by which a trolley street car can be stopped almost instantaneously, or within a space of three feet, while the car is going at full speed. As he omits, however, adds *The Railway Review*, to provide for stopping the passengers, it is only fair to presume they will object.

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The Launch of the Battle Ship Oregon.

The battle ship Oregon was launched at the Union Iron Works, San Francisco, October 26. Technically the Oregon is known as an armored coast-line battle ship of the first class and is one of three the bids of which were opened October 1, 1890. The sister ships are the Massachusetts and Indiana, both built by the Cramps in Philadelphia. Congress appropriated the sum of $12,000,000 for the three ships and provided that one should be built on the Pacific coast.

The length of the Oregon is 348 feet, beam 69¼ feet, draught 24 feet, displacement 10,200 tons, maximum speed 16·2 knots, sustained sea speed 15 knots. The coal capacity is 1,800 tons, making the radius of action at full speed 5,000 miles, or at a speed of ten knots per hour, 16,000 miles. It is protected by a belt of armor seven and one-half feet wide—three feet above and four feet below the water line—and eighteen inches thick. Over the belt is a steel protective deck 2¾ to 3 inches thick. Rising from the armor belt at each end are redoubts 17 inches thick, giving an armored freeboard of 15 feet 2 inches. In these redoubts revolve the great turrets, which are 17 inches thick on the incline and 20 on the horizontal. Forward and aft of the belt are heavy protective decks and the coal is stowed to give additional protection. The steel conning tower is 10 inches thick and will be provided with signals, speaking tubes, etc. One military mast is provided carrying two tops for rapid fire and machine guns, the ammunition being sent up through the mast. The engines are of the twin screw, vertical triple expansion, direct acting, inverted cylinder type, stroke 42 inches, diameters of cylinders 34½, 48, and 75 inches respectively. There are four double-ended and two single-ended auxiliary steel boilers of the horizontal return fire tube type. The centrifugal circulating pumps are driven independently.

The battery is composed of four 13 inch breechloading rifles, eight 8 inch breechloading rifles, four 6 inch rifles, twenty 6 pounder rapid-fire guns, two Gatlings and 6 torpedo tubes. The secondary battery is very heavy and would annihilate any small vessel which came within range. The 13 inch guns are 18 feet above the water and sweep through a training arc of 270 degrees. The ammunition will be hoisted through armored tubes. The magazines are specially well protected. Altogether the Oregon is a model battle ship.

The Planets for December.

Mercury will be morning planet during December and will be visible to the unaided eye during the middle of the month. One must look toward the southeast about an hour before sunrise in order to see it. Mercury will be at greatest elongation, west from the sun 21° 23′, Dec. 14, at noon.

Venus will be evening planet during December, setting in the southwest between seven and eight P. M. Although so brilliant to the eye it will not, on account of its low altitude, be in good position for telescopic observation in northern latitudes. Venus will be at greatest elongation, east from the sun 47° 29′, Dec. 6, at 3 h. 36 m. P. M. In the southern hemisphere this will be a very favorable opportunity to study the surface markings of Venus, and it is to be hoped that Prof. W. H. Pickering and his assistants at Arequipa will be able to add much to our knowledge of this subject and of the rotation of the planet.

Mars will be morning planet, but is getting farther south all the time, so that its position will be unfavorable for northern observers. In the southern hemisphere the conditions will be much better. There will be quite a close conjunction of Mars and Uranus December 6 at 4 h. 9 m. central time, when the former will be only 8′ north of the latter. Observers in Australia and Japan should be able to see the two planets in the same field of view of the telescope. The ruddy color of Mars and the green hue of Uranus will present a striking contrast. Elghteen hours later Mars will pass close to the wide double star α Libræ, the components of which Webb puts as third magnitude, pale yellow, and sixth magnitude, light gray. Mars will pass 11′ north of the brighter star.

Jupiter, having but just passed opposition, will be in excellent position for observation during December. We have had a few good views of the planet this year, when much of fine detail was seen upon the surface, notably a large number of very small dark red spots. We have not happened to look at the time when the "great red spot" was visible and cannot say what its appearance this year is. The apparent diameter of Jupiter during December diminishes from 46″ to 44″. His brilliancy will be greater than that of any other object in the evening sky, excepting the moon, so that none can mistake him. His course is slowly westward in Taurus.

Saturn will be visible in the morning, but at a low altitude, so that for northern observers there will be no satisfactory observations. Saturn is in the constellation Virgo, just a little north and east of the star Spica. The planet is the brighter of the two. The rings of Saturn are pretty well opened now, the angle of their plane to the line of sight being now about 12°, and increasing to 14° at the end of December. Saturn and the moon will be in conjunction December 3 at 3 h. 20 m. P. M., and December 31 at 1 h. 41 m. A. M. Saturn will be about 3° north of the moon in both instances.

Uranus is in Libra, very close to the star α, referred to above in the note on Mars. At 5 h. 32 m. on the morning of December 16 Uranus will be in conjunction with the star, only 3′ north. The conjunction with Mars has already been mentioned.

Neptune will be at opposition December 3, and therefore in best position for observation during December. Its motion during the month will be 53′ west and 6′ south. The position December 1 will be one-third of the distance on a straight line from ι to ε Tauri. A photograph taken at Goodsell Observatory, October 18, shows no star as bright as Neptune within 1° of this position.—*Astronomy and Astro-Physics.*

BROOKS' COMET OF 1893.

The announcement of the discovery of this comet on the morning of October 17 has already appeared in the SCIENTIFIC AMERICAN, with the promise of further particulars when sufficient observations had been secured.

The comet was observed on four succeeding mornings, before clouds and the full moon interfered, and these observations showed that the comet was moving in a northeasterly direction, with a rate of three-quarters of a degree daily.

The comet passed perihelion about September 20, so that theoretically its brightness should be decreasing, but it is holding its light well, and on the morning of October 22 it appeared brighter than at any previous observation. The tail then had a slight curve near the head and a faint auxiliary tail was seen branching from the main tail at an angle of thirty degrees.

THE BROOKS COMET OF 1893.

The accompanying drawing shows the normal appearance of the comet when the tail was straight and as viewed with a power of forty diameters in the telescope. The tail could be traced to a length of three degrees.

As the comet may be followed for some time with moderate sized telescopes, I send herewith a few positions, from which the course of the comet can be plotted to the end of the month or longer.

	R. A.		Decl. North.	
	hour.	m.	deg.	m.
Oct. 19	13	24	40	20
Oct. 23	13	35	44	40
Oct. 27	13	50	49	12
Dec. 1	14	05	53	33

From the above it will be seen that toward the end of November the comet becomes circumpolar. and hence observable all night, and on November 27 it is just at the end of the tail of the Great Bear.

WILLIAM R. BROOKS.

Smith Observatory, Geneva, N. Y., Nov. 8, 1893.

Remedy Against Epilepsy.

S. A. Siminoff (*Med. Obozr.*, xxxix., 1893, No. 4, pp. 391-2) details three cases of epilepsy cured by him by the administration of an infusion of common tansy. He has also used this decoction with good effect in cases of neurasthenia, where valerian had ceased to be effective. A glassful of the infusion of the herb (either fresh or dried) is given to the patient at night and in the morning.

Correspondence.

A Family Dough Kneader.

To the Editor of the Scientific American:

Would you kindly draw attention of those of inventive ability to the great need of a machine for kneading dough for family use?

Such an article that would be self-cleaning, and not too expensive, would secure a fortune for the inventor. Every one in the country likes good bread, and the principal cause of failure comes from not being properly kneaded, which a good machine would remedy.

JAS. A. MCCAFFREY.

How to Make an Egg Stand on End.

To the Editor of the Scientific American:

My method of standing an egg on end is not by cracking it, but by taking the egg in one hand and striking it in the other three or four strong licks, which readily breaks the thin membrane separating the air from the end of the egg; it also breaks up the yelk of the egg; the parts of the contents of the egg being thus free to move among themselves, the heavier ones settle at the bottom, the lighter ones above, and the air at the top. This is done by placing the egg on end a few seconds and holding it perpendicularly. The center of gravity is thus easily brought within the base and the egg stands readily on either end. I find that this is a fact that is known by but few. It is sometimes used by jugglers who pretend to conjure by incantations. I would like to know if this is generally known.

W. M. GRAYBILL.

[*Ans.*—A common mode of detecting the condition of eggs is to try to stand them on end. If good, it cannot usually be done. If bad, it can easily be done.—ED. S. A.]

Welsh Anthracite Coal.

The price of the screened Welsh anthracite, free on board at Cardiff or other shipping port, as named in a recently proposed contract, is 3s. 6d., or say 85 cents per ton of 2,240 pounds, while it is counted that the cost in New York harbor will not exceed $2 per ton. There is no import duty on anthracite. The contract calls for deliveries of 500,000 tons a year and as much more as is wanted is to be supplied, subject to the usual reservations in case of strikes, etc. The Welsh anthracite has, when dry, an average composition of 87 to 92 per cent fixed carbon, about 5 per cent of volatile matter, and 3 to 6 per cent of ash. It is an excellent steam coal, and no doubt would, at the prices mentioned, make serious inroads into the market for anthracite and even bituminous coal used in steam making. It would not, however, become as popular a domestic fuel as our sized and clean anthracite, though a marked difference in price would open many doors to it.

The presence of this fuel in our market will cause the managers of our coal roads to consider more favorably the demands of the anthracite miners for lower tolls to tidewater. and the low prices at which it can be sold will be of interest to the holders of the coal road stocks.

It is rather curious that while we are arranging for the importation of Welsh anthracite at such extremely low prices as will make it a formidable rival to our own coal, we could ship our Virginia, Maryland, and Pennsylvania bituminous coals to London at a large profit, owing to the high price ($11 to $12 a gross ton) which coal now commands there on account of the coal miners' strikes in the north of England.—*Boston Journal of Commerce.*

Round Shoulders Cured.

A woman physician has recommended to the Boston *Herald* the following simple exercises, requiring little time and no apparatus, for the cure of all except very severe cases of round shoulders, when braces are also sometimes a necessity: "1. Raise arms before your shoulder high, extend arms sidewise, throw head back, straighten head, move arms forward, lower arms, repeat ten times. 2. Stand erect, raise arms before you, rise on tip toes, then throw arms as far backward as possible, sink again on heels and drop arms to side, repeat ten times. 3. Raise arms with elbow bent shoulder high, bringing palms together in front of face, then with elbows still bent swing both arms vigorously backward as far as possible even with the shoulders, palms looking forward. This should be repeated several times, but as the position is somewhat fatiguing, rest or change of exercise may be made between the movements."

Another simple movement designed to bring about a correct position of the shoulder blades consists of holding a cane or wand in both hands, throwing the head back and carrying the stick from "above the head back and down the hips."

As the clothing, if too tight or unyielding about or over the shoulders, may help to produce round shoulders, both the under and outside waist should be comfortable and bands over the shoulder of garments made of elastic.

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MOVABLE NIGHT LAMP FOR STAIRWAYS.

Many persons, either through habit or by reason of their occupation, enter the house at night after the gas has been put out. Now, there is nothing so disagreeable, and often even so dangerous, as to go up or down stairs in the dark. And yet it is indispensable for the sake of economy, and especially for safety, to shut off the gas at the meter for the night in every house. The movable night lamp, which operates at an expense of but one cent a night, presents the advantage of accompanying those who go up or down stairs after the gas has been put out. The operation of it is simple: It suffices, in order to light one's way in going up stairs, to grasp at the bottom of the staircase a light counterpoise fixed to the lamp by a cord, and the lamp then ascends with the person and affords him light progressively (Fig. 1).

When the story at which one is to stop is reached, the lamp, upon the weight being released, descends of itself to the bottom of the stairway and remains at the disposal of new comers. In order to descend with a light, from no matter what story, it suffices to raise the lamp through the chain that supports it (an operation that requires three seconds) and to grasp the counterpoise. The lamp then follows the person to the bottom of the staircase.

Mr. Armand Murat, the inventor of this apparatus, has here solved a problem which has certainly been studied by numerous investigators, but who, instead of solving the question *in situ*, have devoted their efforts to the creation of various models of small pocket lamps, which, despite their ingenuity, have never answered the practical side expected by the public. Fig. 2 gives the details of the mechanism of the ingenious apparatus. A ring, A, is fixed to the center of the ceiling of the stairway, and supports a pulley, C. Two cables, kept parallel, run from the top to the bottom, and are fixed to the point, B, and are rendered taut by stretchers, B'. The pulley, C, has a corresponding one, C', below. A chain, D, passes in the groove of these two pulleys, and carries a counterpoise, P. The cheeks of the bottom pulley support a weight, P, through a rod that passes freely through the bar, R, fixed to the wall or staircase. This weight, P, thus draws upon the chain and keeps it always equally taut. A plate, H, is traversed by two tubes, K, to which it is soldered. These two tubes are connected by a straight bar at S and S'. The chain and its counterpoise, F, traverse the plate at V. The cables pass into the two tubes, K, and serve as a guide to the lamp that is screwed to the center of the plate. The two extremities of the chain are attached to the center of the bars, S and S'. The plate, terminating in the form of a reversed T, supports upon this T a roller formed of two perforated balls connected with each other by an open ring, L, forming the two axles of the balls. This roller is thus capable of revolving around the plate without touching either the chain or the tubes.

To the ring, L, is attached a cord that terminates in a tassel, M, that conceals a weight. A regulator placed in the shell of the upper pulley regulates the motion of the apparatus during the descent.

The apparatus operates as follows: The counterpoise, F, is heavier than the lamp, L, and its support, but not so heavy as they are when the weight, M, is added to them. The result is that, if a person ascends the stairs in holding the weight, M, in his hand, the counterpoise, F, descends, and the lamp precedes and affords him a light.

Upon reaching the story at which one wishes to stop, the counterpoise, F, upon the weight, M, being freed, rises and the lamp descends alone to the bottom. In order to bring the lamp from any story whatever, to utilize it, it suffices to pull the chain upon the side, F, until the weight, M, rises within reach of the hand, which it will do in about four seconds from the sixth story.—*La Nature.*

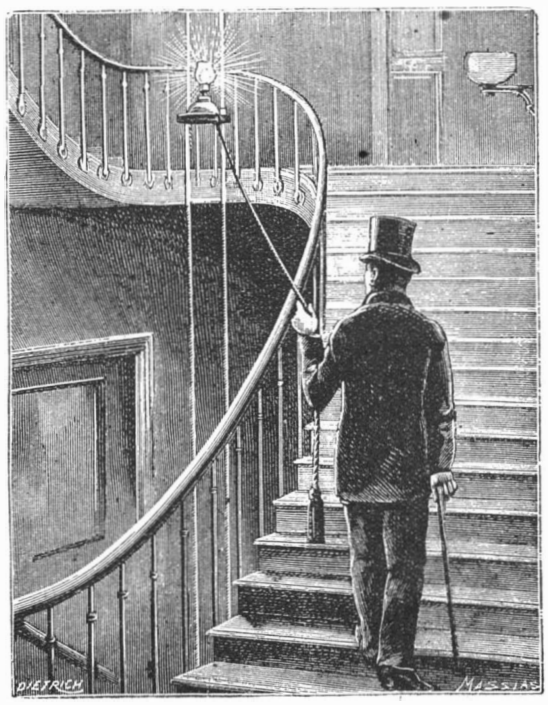


Fig. 1.

Fig. 1.—MOVABLE LAMP FOR STAIRWAY.

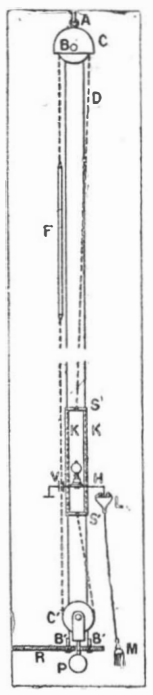


Fig. 2.

Fig. 2.—EXPLANATORY DIAGRAM.

THE NEW DUDLEY OBSERVATORY, IN ALBANY.

The Dudley Observatory, of Albany, N. Y., opened in 1856, has always held a high rank. It was named in memory of Hon. Charles E. Dudley, the original gifts from Mr. Dudley's widow amounting to $105,000; to which was added over $80,000 from private donations in New York City and Albany. The staff of the institution has included some of the best known astronomers and scientists in the country, among them Dr. Benjamin A. Gould, Dr. C. H. F. Peters, Dr. Francis A. Brunnow, Professor O. M. Mitchell, and Professor George W. Hough. The present director of the observatory, Professor Lewis Boss, appointed in 1876, is a graduate of Dartmouth College.

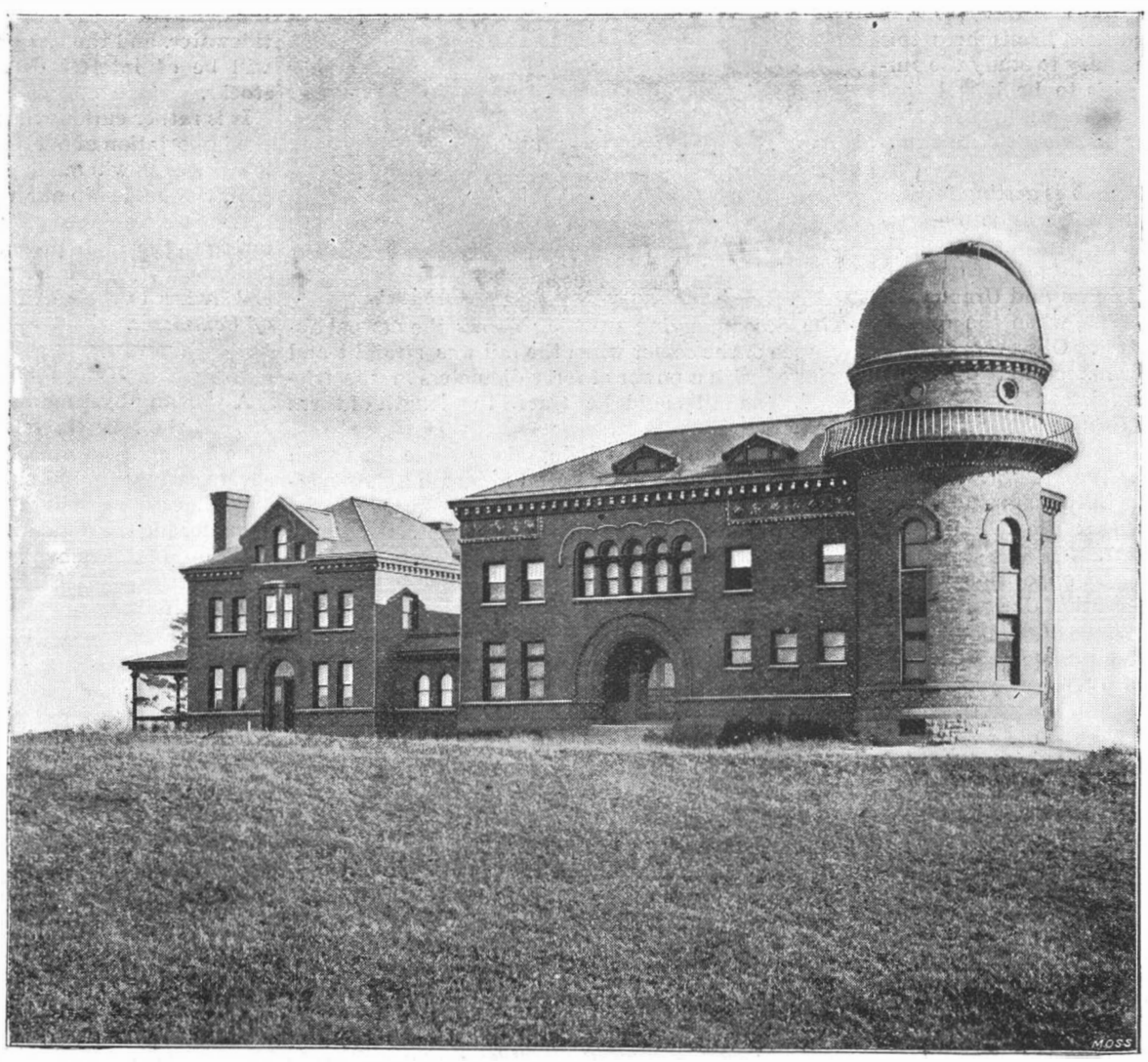
The original location of Dudley Observatory has proved unfortunate, because it was close to the tracks of one of the largest railroads in the country. New buildings on a new site became, therefore, a necessity, if the institution were to continue to perform valuable work, and for this object Miss Catharine Wolfe Bruce gave $25,000, afterward increasing the amount by $10,000. Private subscriptions of over $20,000 were added; and the city of Albany gave a lot and $15,000 in exchange for the old property. The endowment fund stood at $84,000 before these gifts. It has been almost doubled. But the efficiency of the observatory has been more than doubled by the new buildings and by a new telescope with a lens of $12\frac{2}{10}$ inches in diameter.

The site of the new buildings, about one mile from the capitol, is excellently adapted to the purpose. The instruments will all be at least 300 feet from the nearest road, and more than a mile from the nearest railroad. The horizon is unobstructed in all directions and there is no danger of future damaging encroachments by buildings. The new buildings consist of the main observatory structure, 70 by 35 feet, with a fireproof tower on the southwest corner, which supports a revolving dome 21 feet in diameter, under which the new telescope is to be placed on a pier resting upon a deep foundation and throughout its length isolated from contact with the building or its floors. The lower floor contains a library and lecture room 30 by 20 feet, also two computing rooms, a clock room, and other small rooms. The second floor serves for laboratories and a dormitory for assistant observers. Connected with the main building by a corridor 20 feet long is the dwelling for the astronomer, which is 34 by 50 feet.

The new telescope which is added to the five instruments which were in the old building is the Pruyn equatorial, the gift of Robert C. and Charles L. Pruyn. The telescope, although not comparable in size with some of the giant telescopes of modern times, is large enough for the use of the practical astronomer in the great majority of cases in which he requires an instrument of precision. The size is better adapted to exact measurements than is that of larger telescopes. The objective glasses of the telescope, slightly more than 12 inches in diameter, were polished by Branhear, of Allegheny, Pa. The length of this telescope is 15 feet when arranged for the customary use, but within less than twenty minutes at any time this telescope, by exchange of objective glasses and by other adaptations, can be converted into a powerful telescope for celestial photography, as perfect in all respects as if the instrument had been designed for that purpose alone. Attached to the main tube is a third telescope 12 feet in length, which has various uses, and is the guide telescope in photographic work. The "finder" is a fine three-inch telescope.

The buildings are solidly and plainly constructed after designs furnished by architects Fuller & Wheeler, of Albany. The entire cost of the two buildings complete is somewhat less than $30,000. In the rear of the buildings, and at a distance of about 100 feet from them, is a small structure with iron framework covered with galvanized iron. Outside of this is a covering of louver work, affording a free circulation of air between the outer and inner coverings. This building contains the meridian circle, the chief instrument to be used at present in the work of the observatory. The roof is built in sections, each section arranged to roll back upon rails when desired, in a manner such as to leave an opening six feet wide from north to south through the center of the building. Through this opening the observations are to be made. In connection with the meridian circle is provided a tubeless horizontal telescope 300 feet long, the glass objective and the focal mark being supported on massive piers covered with small iron sheds to protect them from the elements.

The reopening of the Dudley Observatory took place on the 8th of November. The National Academy of Sciences met in Albany on that occasion and the address was delivered by Professor Simon Newcomb, superintendent of the Nautical Almanac office in Washington.



THE NEW DUDLEY OBSERVATORY, ALBANY, N. Y.

THE expansion of water in congelation is such that eleven feet of water make twelve feet of ice,

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THE WORLD'S COLUMBIAN EXPOSITION—THE INDIAN SCOUT.

All through the grounds, and especially in the Court of Honor and around the lagoons rise beautiful pieces of sculpture, modeled in staff. "Old Ephraim," "A Grizzly Grave Digger," "At Bay," "The Still Hunt," and others are well known, and the two imposing groups of "The Indian Scout" and "The Cow Boy," in front of the Transportation building, scarcely less so.

"The Indian Scout," which we illustrate, was executed by Mr. A. Phimster Proctor, who was also the sculptor of the bold and impressive "Cow Boy" group at the other side of the steps near the great golden doorway of the Transportation building. The Indian, grim-visaged, with his hand shading his eyes, scans the prairie. The tense listening expressed in every line and muscle of his figure is much commended. The Indian is no specimen of the reservation creature, which modern civilization is annihilating, but the bold, free chief endowed with all the traits of a race now rapidly becoming extinct. As for the horse, one can almost see the flesh quiver, so naturally is it modeled. Beyond the group will be noticed the rear end of the Mines building and the huge dome of the Administration building.

The Volcano of Kilauea, Sandwich Islands.

Dr. S. E. Bishop, writing to the *Independent*, says: A macadamized road of the best quality is now nearly completed from the seaport of Hila, thirty-one miles, to the volcano, which will make a delightful drive of five hours up and three back, through exquisite tropical forests. This road has opened up the center of a hitherto inaccessible tract of superb coffee lands, one hundred thousand acres in extent, which are being taken up faster than surveyors can cut their way to them. The region is cool, moist, and free from miasm, well fitted for white settlers. Hila itself is a gem of beauty. It will soon have opened up in several directions the finest back country of any part of the group.

The volcano itself is in prime order for tourist inspection. The red crust of the lake is seamed with long zigzag crevices of bright fire creeping across its breadth. Here and there in the center, or around the rim, fountains of the massive white metal leap up and fall back with heavy crash, or play aloft with surging crests of dazzling fire. Now and then a great power wells up from below, and the whole lake becomes a white, molten, and surging surface, and pours a flooding sheet of fire over some part of the black floor around it, driving away in haste any visitors who have gone into the pit to fish up melted lava with their sticks. Two weeks ago the lava flood made a huge rush and carried away all the parapet walls which it had built up, and filled the whole bottom of Halemaumau pit with a surging lake, one hundred acres in breadth. The level of the lava is working well up toward the top of the pit, and must within a few months overflow upon the main floor of Kilauea, as is its habit.

The Sprouting Insect.

The *Home Journal* says: "One of the most curious natural productions of the West Indies is the famed vegetable fly, an insect about the size and color of a drone bee, but without wings. In the month of May it buries itself in the earth and begins to vegetate. By the beginning of June a sprout has issued from the creature's back, and made its appearance above the surface of the ground. By the end of July the tiny tree (known on the island as the fly tree) has attained its full size, being then about three inches high, but a perfect tree in every particular, much resembling a delicate coral branch. Pods appear on its branches as soon as it arrives at its full growth; these ripen and drop off in August. Instead of containing seeds, as one would naturally suppose, these pods have from three to six small, hard worms upon the interior."

Professor Riley says: "The above item has been going the rounds of the newspapers for at least four or five years. I received it two and a half years ago from a correspondent and commented upon it in *Insect Life*, volume iii., page 399. It is a romance with a grain of truth. The probabilities are that the story had its origin in the growth of a fungus of the genus Cordyceps from the back of a subterranean insect. This fungus as it appears above ground is probably attacked by a fungus gnat of the family Mycetophilidae or by some fungus-eating beetle, and it is the larvæ of the latter which are described as the small hard worms. On page 218 of volume iv., *Insect Life*, I have figured and described a species of Cordyceps which grows from an underground larva in China and which is used in that country as a medicine, having the same effect as ginseng."

Safety Devices for Street Cars.

The frequent accidents due to the increased speeds of the street cars, when the cable or electricity is used in place of horses, have created a demand for an effective device to save the lives of persons who fall in front of such cars.

The form of fender now in use on a line between Lynn and Boston is a frame of S-shaped steel wire, the lower bar of which is covered with rubber. It may be run close to the track or lifted high above it, the height being controlled by a releasing device operated by the knee of the motorman. Repeated experiments on dummies placed on the track have demonstrated that this fender will pick up man, woman or child and carry them along without harm in a large proportion of cases.

Another device consists of a framework of light steel, which projects four feet in front of the car. A strip of flat rubber four inches wide extends along the tip, forming a cushion and scoop. The body of the fender is of wire netting and canvas.

The inventor claims that if a person be struck by the fender the rubber tip will pick him up, and he will fall into the canvas net without injury.

There is still plenty of room for first-class inventions in this line.

Extracting Gold from its Ores.

In this process molten lead is used for extracting gold from its ores instead of mercury. The lead is melted on a shallow hearth and the powdered ore is fed in at one end and carried forward as a film over the surface of the lead by means of an agitator moving over that surface. It is thus brought to the other end, where it escapes through a hopper. In order to prevent oxidation of the lead, the chamber is kept filled with carbonic oxide from a gas producer.

THE WORLD'S COLUMBIAN EXPOSITION—THE INDIAN SCOUT.

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Gas Motors for Street Cars.

The *American Manufacturer* says that in several reports made by various authorities recently is given considerable information relative to the progress which has been made in Continental Europe in bringing gas motors into use for driving street cars; one a report by Herr Stucker, read before the last meeting of the Swiss Gas and Water Association, on the gas-driven tram line between Neuchatel and St. Blaise. In that report Herr Stucker says that Neuchatel has extended considerably along the shores of the lake and tramways have become a necessity. In planning the new line from Neuchatel to St. Blaise, the question of the choice of power came up for serious consideration. Horse power, electricity, and compressed air all had their advocates; but all were too dear, and the decision arrived at was one in favor of the use of coal gas.

Compressed air has the advantages of having no noise, no smoke, easy starting and stopping. It gives great satisfaction in Berne, on account of its quietness; but it costs there about 15 cents per car mile, although inexpensive hydraulic machines are used for compression. The line is also too expensive for any suburban district. Steam is somewhat less in its first cost than compressed air, but a locomotive has to be moved about as well as a car, and two persons are required for each machine, while the engines make much noise and smoke. From Wiesbaden to Biebrich there run locomotives which are said to be free from these faults, but they cost $5,950 each. Steam roads pay when there are many passengers; not unless. Horse roads are cheap in first cost, but the current cost is high. None of these is particularly well adapted for a line on which the traffic is expected to be very small, say seven passengers per run.

In the present case, the best means is the use of gas motors, using cylinders of gas compressed to 10 atmospheres, and containing enough gas to do the run out and home. The firm of Gillieron & Amrein, Vevay, undertook to supply the gas motors. They are strong, simple, practical, and safe, and free from noise and smoke; they only require a weekly cleaning. The starting and stopping are instant and free from shock. The weight of the car, with 20 passengers, 1 driver, and 1 conductor, is about 6 tons. The distance is 3⅛ miles, and the highest ground is half way, 40 feet higher than Neuchatel; 7·9 horse power are necessary to get up a speed of 11¼ miles an hour. If another car were hitched on, also fully loaded, the journey would take 27·4 minutes. The cost of gas, with one car, would be at $1.12 per 1,000 cubic feet, ½ cent per passenger and per journey, and with two cars it would be 22 cents.

A report to the municipality of Nordhausen upon the gas-driven street cars in use in Dresden states that the gas is let in at six atmospheres pressure to permanent holders under the car. The gas is always admitted to the motor at the same pressure. The cooling water is in a tank at the top of the car, and it circulates naturally down to the cylinder when cool and up to the roof when warmed. Herr Luhrig, the inventor of the car, finds this simple device very satisfactory as means of cooling the cylinder. Starting and stopping, even on heavy inclines, are quite easy and trustworthy. The report is decidedly in favor of the adoption of the new system by the town of Nordhausen, and points out that the durability of this system, as compared with that of an electric railway, is far greater. There are no wires to lay out upon a compression station. On the other hand, a gas car costs more than an electric one; say $5,000 each, while the Swiss ones, previously referred to, cost $3,000 each. An electric line pays when there is a big traffic. Gas can run a small traffic. A gas car can go anywhere, and there may be few or many in use. Electric cars are a good deal dependent upon one another, and upon the arrangement of the track for them.

Another report to the Nordhausen authorities gives the following as the advantages of gas cars over electric cars: Much less first cost, since the gas company will undertake the supply of gas in a compressed state, and there is nothing farther necessary except a car shed; less current cost, since there are no central stations or conductors to keep up, and the outlay, apart from gas, which costs only three cents per mile, is limited to lubrication and cleaning material, repairs, upkeep of rails, wages and renewals, independent action of the cars, so that there cannot be a general breakdown; ease of making a small beginning, and extending as occasion offers; no consumption of gas when not running, while an electric station must keep going; ease of putting an abnormal number of cars to run on the same line when there is an extra demand; ease of replacing the gas motors by electric motors, if at any time thought advisable, while the inverse change cannot be made in an electric car.

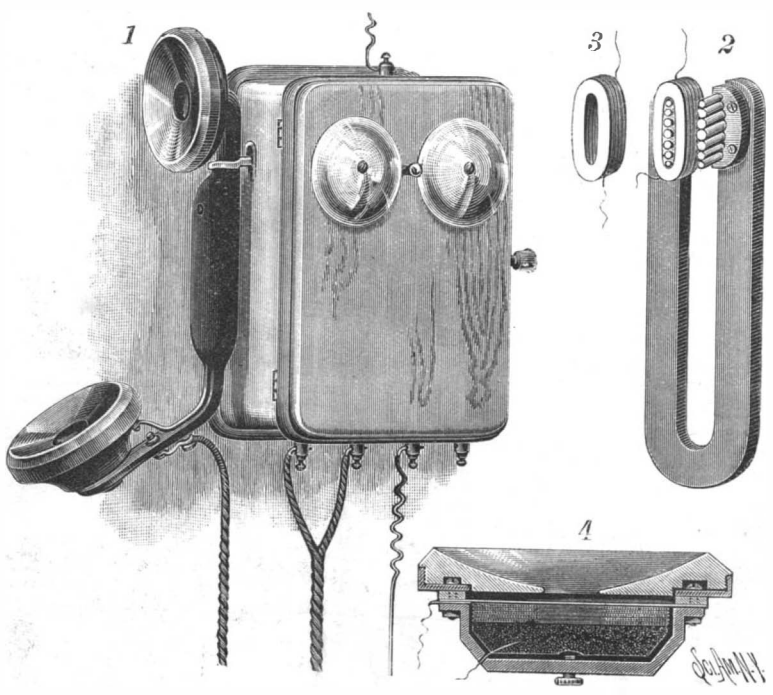
The Dessau German Continental Gas Company in a recent report stated that the application of gas for driving street cars recently introduced in Dresden may stand in importance next to the introduction of the Welsbach lamp, and that the absence of overhead or underground wires and big central stations makes it possible to work such a system with small capital, while the known cheapness of working of gas motors is by this means taken advantage of.

NORIEGA'S TELEPHONE.

For some years past Mr. Eloy Noriega, a Spanish gentleman, residing in the city of Mexico, Mexico, has been devoting a great deal of attention to electrical inventions, especially to the microphone and telephone. An interesting collection of these instruments was shown at the World's Columbian Exposition, Chicago, where they attracted much attention. From these we have selected for illustration one of the simpler forms, which is a practical and useful telephone.

Fig. 1 of the engraving shows the instrument completed, arranged for practical use; Fig. 2 is a perspective view of the receiver magnet detached from the telephone; Fig. 3 is a perspective view of one of the receiver coils; and Fig. 4 is a section of the transmitter.

In the box containing the magneto call is placed the induction coil, the telephone switch, and the transmitter and receiver are connected up in the usual way. A flexible cord carries wires for both receiver and transmitter. As will be noticed by reference to the engraving, the receiver and transmitter are both secured to an adjustable handle, so that while the receiver is at the ear, the transmitter will be in convenient position for receiving speech. The peculiarity of the transmitter is the device by which the necessary variable contact is secured. Behind the diaphragm is placed a layer of carbon filaments, similar to those used in incandescent lamps. This layer of filaments is backed up by an adjustable carbon plate. The diaphragm forms a part of the circuit, and when sounds are uttered in the vicinity of the diaphragm, the vibrations of the diaphragm alternately compress and release the carbon filaments, thus changing the conductivity of the transmitter and producing the variations in the primary circuit necessary to the transmission of speech.



NORIEGA'S NEW TELEPHONE.

The receiver is provided with a U magnet, with pole pieces extending from its sides, the pole pieces being formed of series of studs of different diameter. Upon each pole piece is placed a coil, the two coils being connected up in the line circuit in the usual way.

In this instrument all the conditions for convenience in use and for high efficiency are to be found. Mr. Noriega has thus in one invention materially improved the telephone and reduced it to its simplest form.

Cholera Caused by Nitrous Acid.

The *Universal Medical Journal* calls attention to the fact that animals poisoned by nitrous acid present all the symptoms of choleraic patients. It is well known that Professor Emmerich, of Munich, and Professor Ziro Tsuboi, of Tokio, conclude from numerous experiments that Asiatic cholera is a toxæmia by nitrous acid generated by the comma bacillus of Koch. Notwithstanding the fact that more than ten years have elapsed since the comma bacillus was discovered, no great progress has been made as regards the actual cause of cholera. At the beginning of the last decade, ptomaines were shown to exist in the cultures of bacteria, and it was assumed that in all infectious diseases the symptoms of the malady, as well as death therefrom, were caused by these organisms. A few years later there were also found in older cultures of tuberculosis and diphtheria bacilli certain poisonous albumens, and immediately upon the disclosure of this fact many investigators, adhering to the opinion that disease and death from all contagious maladies are caused by the presence of these albuminous poisons (similar, perhaps, to those of poisonous snakes), spent much time in endeavoring to discover them in cultures of all kinds. The two physicians above named, instead of being influenced by these prevailing opinions, expressed the belief that the nitrous acid generated by the cholera bacilli is to be regarded as the true cause of all the symptoms and of death by cholera. O. Low had already shown that nitrous acid is a powerful toxic. The authors first proved by experiments on guinea pigs, rabbits, and dogs that poisoning by nitrous acid caused precisely the same symptoms in guinea pigs as those induced by inoculation of cholera. They further showed that the type of disease induced by nitrous acid poisoning in man corresponds exactly with all the symptoms of Asiatic cholera. Poisoning by nitrous acid can be proved by examination of the blood by spectral analysis, and it is an interesting fact that the blood of guinea pigs having died of induced cholera presents exactly the same appearance in the spectrum as that of animals poisoned by nitrous acid.

Simulation in the Insane.

Dr. Larrousinie, *These de Paris*, 1893 (abstr. in *Jour. de Med. de Paris*, No. 26), shows very justly how it is for the interest of society as well as for that of the patients that the alienist physician should recognize that simulation is very common among the insane, and that it may lead to serious results if not detected. He shows that this fact, though known back to Pinel, has only of late years attracted much attention, and he regrets that friends, magistrates frequently, journalists invariably, and sometimes even physicians who are not specialists, should be the dupes of the insane, by which fact much of the outcries against asylums and the disastrous disagreements and divisions that are often seen, are caused.

Dr. Larrousinie studies successively the simulation in the non-dangerous and the dangerous lunatics, and gives a special chapter to the pyromaniacs, in whom it is the rule. It may be met with in all forms of derangements, but the impulsive forms, excepting pyromania, are most free from it. It is especially common in systematized delusional insanity, a fact of importance, as this is one of the most dangerous forms. It may present itself as partial or total and in an infinite number of degrees. In general, self-interest is the motive. One tries to deceive to facilitate his escape, another has the notion of revenge. Sometimes shame is the cause, as frequently happens in females with sexual hallucinations. It is of importance, therefore, for the physician to see through the deception; he should be easily suspicious of it, and should study his patients with the greatest care in view of the possibility of simulation. The author ends his thesis with the recommendation that a medical expert should sit with the judge in cases where the question of the retaining or discharge of a patient in an asylum is involved. In case of a disagreement a second expert should be called in to decide the case.—*Amer. Jour. of Insanity.*

Remedial Use of Apples.

Chemically the apple is composed of vegetable fiber, albumen, sugar, gum chlorophyl, malic acid, gallic acid, lime, and much water. Furthermore, the German analysts say that the apple contains a larger percentage of phosphorus than any other fruit or vegetable. The phosphorus is admirably adapted for renewing the essential nervous matter—lecithin—of the brain and spinal cord. It is, perhaps, for the same reason, rudely understood, that old Scandinavian traditions represent the apple as the food of the gods, who, when they felt themselves to be growing feeble and infirm, resorted to this fruit, renewing their powers of mind and body. Also, the acids of the apple are of singular use for men of sedentary hibits, whose livers are sluggish in action, those acids serving to eliminate from the body noxious matters, which, if retained, would make the brain heavy and dull, or bring about jaundice or skin eruptions and other allied troubles. Some such experience must have led to the custom of taking apple sauce with roast pork, rich goose, and like dishes. The malic acid of ripe apples, either raw or cooked, will neutralize any excess of chalky matter engendered by eating too much meat. It is also the fact that such ripe fruits as the apple, the pear, and the plum, when taken ripe and without sugar, diminish acidity in the stomach, rather than provoke it. Their vegetable sauces and juices are converted into alkaline carbonates, which tend to counteract acidity.—*North American Practitioner.*

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Torpedo Net Tests.

The question of the protection of our vessels from torpedoes is as important as that of furnishing them with torpedoes, or even more so. An interesting series of experiments on torpedo nets is now being conducted at Newport; in all probability the tests will extend well into the winter, as only one or at most two shots can be fired a day while the present routine of duty and instruction is maintained at the station. The weapon used was the submarine gun of the Destroyer and the projectile weighed 1,600 pounds. The Midgley net was tried first. The net was fifteen feet wide and twenty feet deep and was placed 200 feet in front of the Destroyer, attached to a heavy spar. The net was easily pierced, the projectile remaining uninjured. Another piano wire net twice as strong was used at the same range and was pierced as easily, one of the heavy vertical strands being cut through. The heaviest of the American nets will be moved away until the projectile fails to pass through, then the English (Bullivant) net will be tried. The comparative strength will then be easily determined.

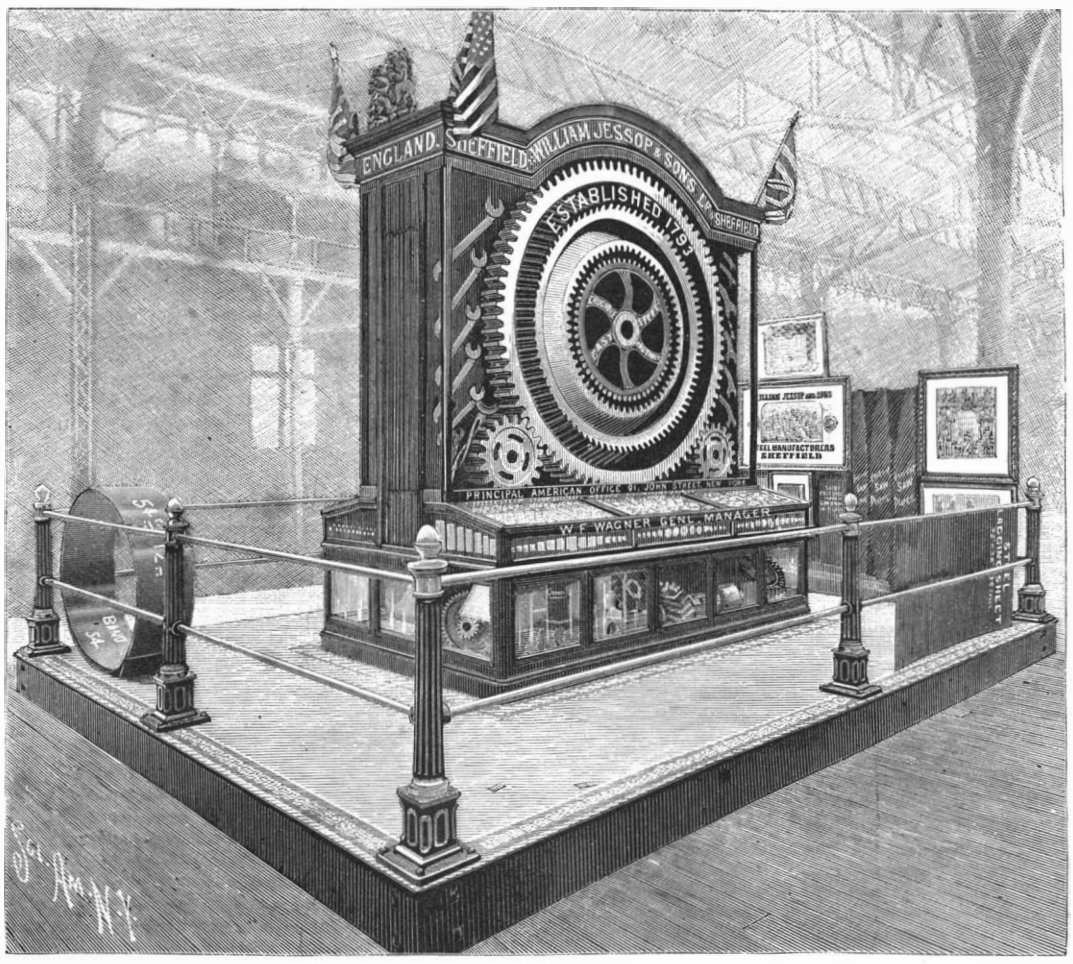
The American net can be more easily handled than the English, as it only weighs 400 pounds, while the English weighs 660 and is so designed that it cannot be rolled up. The effect of the ordinary wash of the sea upon the hang of the net when the vessel is under headway will also be determined. The success or failure of a net depends upon its ability to stop the torpedo or so interfere with or delay it as to cause the explosion to take place before the side of the war vessel is reached. The tests are being well conducted and the results will be looked for with interest.

SHEFFIELD STEEL AT THE EXPOSITION.

In the British section of the Mining building an exhibit of singular interest was that of William Jessop & Sons, Ltd., of Sheffield, England, manufacturers of the celebrated *Jessop steel*, known all over the world for its special adaptability for cutting tools, dies, punches, drills, cutlery, needles, etc., also sheet steel for saws, pens and springs, and crucible steel castings of all kinds and weights. The factory at Sheffield is known as the Brightside Steel Works, covering an area of thirty acres, and including extensive converting and melting furnaces, forges, rolling mills, wire mills, steel foundry, machine shops, etc. Many of the large ocean steamships are now fitted with heavy castings for stern frames, rudder posts, and bed plates from their foundry. The business was established just one hundred years ago, and for sixty years the house has been permanently represented in the United States, its chief American office being at No. 91 John Street, New York City; Mr. W. F. Wagner being the general manager, with Mr. Jas. Jessop as associate.

The large glass case containing the main portion of the exhibit, as shown in the illustration, is filled with samples of the many finished and unfinished forms into which the Jessop steel has been made. The brilliant and artistic setting of these castings has been greatly admired. There are small and large gear wheels, cams, cross heads, cylinder and cylinder cover, spanners and coal mine car wheels. Some of the castings have been broken or bent cold, and drawn out into instruments with a cutting edge, such as razor, carving knife and chisel, in order to show the malleability and quality of the steel. There is an extensive collection of fractures of various qualities of tool steel, hardened and unhardened, arranged in the show case in pleasing geometrical designs, to the number of nearly twelve hundred, and a display of large and small circular saw plates, so neatly adjusted that they seemingly rest lightly in position, whereas the largest of these massive steel disks weighs over five hundred pounds. There are also finished bars of steel; a 12-inch wide band saw fifty-four feet long; and, to crown all, there is an American flag, made up of alternate stripes of polished and black steel, with steel stars, nickel-plated, which makes a very pleasing effect.

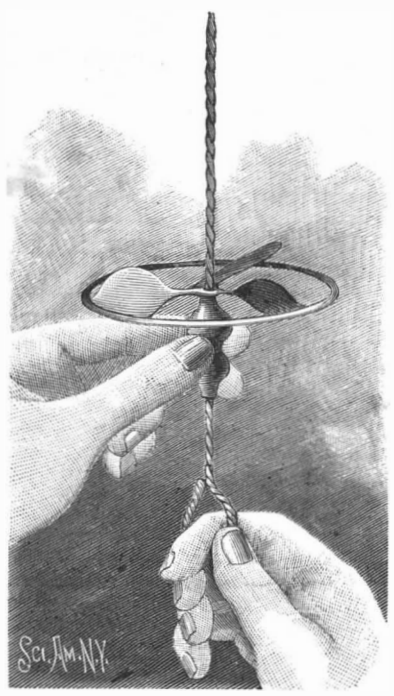
The firm was awarded the medal for highest excellence on their goods shown at the Exposition, but such award was, in their case, notable only as being a continuation of the highly favorable recognition the firm had previously received in two exhibitions at Paris, and at London, Melbourne, Antwerp, Liverpool, and other places. It is the intention of the firm, we understand, to donate the exhibit to the Columbian Museum to be founded in Chicago, and for which many prominent exhibits have already been secured.


ENGLAND. SHEFFIELD. WILLIAM JESSOP & SONS LTD. SHEFFIELD
ESTABLISHED 1793
PRINCIPAL AMERICAN OFFICE 91 JOHN STREET NEW YORK
W F WAGNER GENL MANAGER
Sci. Am. N.Y.

THE WORLD'S COLUMBIAN EXPOSITION—EXHIBIT OF WILLIAM JESSOP & SONS, LIMITED THE SHEFFIELD (ENGLAND) STEEL MANUFACTURERS.

THE FLYING PROPELLER.

This is the name given by the manufacturer to a new form of an old toy which has always been interesting and popular in whatever form presented. This one is the simplest, cheapest and it seems to be the best. The wheel is punched out of a single piece of tin. It has three arms or vanes, which near the rim are in the form of disks inclined at an angle of about thirty-five degrees to the plane of the wheel rim. At the center of the wheel there is a square hole in which is loosely fitted a twisted square rod, and upon this rod, below the wheel, is placed a wooden sleeve, the bore of which is large enough to allow the rod to be readily drawn through it.



AERIAL TOP.

The wheel having been placed upon the rod—as shown in the engraving—the wooden sleeve is grasped between the thumb and finger of one hand, the eye at the lower end of the rod is grasped by the other hand and the rod is drawn quickly downward, thus imparting to the wheel a very rapid rotary motion which causes it to rise to a great height in the air. Sold by the Magic Introduction Co., 321 Broadway, N. Y.

IN Dakota, with a four-horse gang plow, from six to seven acres a day is commonly plowed.

What is Electricity?

Prof. Galileo Ferraris, the genial Italian scientist, whose name is known to all electricians, was recently asked by a young lady what electricity was, but, unlike most others when asked that question, he ventured to answer it, and according to *Cosmos*, wrote in French in her autograph book the following, of which we venture to give a translation, even though the English language hardly does justice to the original in French: "Maxwell has demonstrated that luminous vibrations can be nothing else than periodic variations of electro-magnetic forces. Hertz, in proving by experiments that electro-magnetic oscillations are propagated like light, has given an experimental basis to the theory of Maxwell. This gave birth to the idea that the luminiferous ether and the seat of electric and magnetic forces are one and the same thing.

"This being established, I can now, my dear young lady, reply to the question that you put to me: What is electricity?

"It is not only the formidable agent which now and then shatters and tears the atmosphere, terrifying you with the crash of its thunder, but it is also the life-giving agent which sends from heaven to earth, with the light and the heat, the magic of colors and the breath of life. It is that which makes your heart beat to the palpitations of the outside world, it is that which has the power to transmit to your soul the enchantment of a look and the grace of a smile."

The Third and Fourth Generations.

M. G. Lagneau communicated to the Academie de Medecine, recently, the concluding part of an interesting statistical paper on the population of Paris, in which he proved that the extinction of families of Parisians proceeds with extraordinary rapidity. A little over 60,000 children are born annually in Paris, and the expectation of life at birth is 28·05 years. The population of Paris at the last census was 2,424,703, and M. Lagneau calculates that, if not recruited from the country, the population, at the end of one generation, would be reduced to 1,698,679, a diminution of more than a third; at the end of a second it would have fallen to 1,190,100, at the end of the third to 833,720, and so on, until at the end of the eighth generation *la ville leumire* would contain only 140,700. Probably the real figures would be even less favorable, for, as a matter of fact, it is almost impossible to find a Parisian whose ancestors for three generations have been Parisians. The same, or very much the same, holds good in London. Some ten years ago Mr. James Cantlie, in a lecture which he gave for the National Health Society, challenged any one to produce a Londoner of the fourth generation, a challenge which was not, we believe, taken up. The causes of this dying out of town populations are, no doubt, complex; but M. Lagneau points out two which, in Paris at least, are the most important—the enormous mortality during the first year of life and the very high death rate from tuberculous diseases. This death rate appears to be twice as great in Paris as in London, and M. Lagneau appears to attribute a part of this difference at least to the less density of population on the surface in London. The Londoner has 84 square meters, whereas the Parisian has only 39.—*British Medical Journal.*

The Scientific American.

This paper has stood for the last forty years at the head of its class of publications. It has no superior. As a scientific and mechanical journal it cannot be excelled. The patent agency of Munn & Co., connected with it, is one of the few strictly reliable agencies in the United States. Those of our readers who desire to obtain a patent, and wish to have their interests well attended to, cannot do better than to address Munn & Co., Solicitors of Patents, No. 361 Broadway, New York, for their pamphlet containing full information about patents, caveats, etc.

[To the *Sewing Machine Times* we are indebted for the above kindly notice, a favor unsolicited and hence the more appreciated.—EDS.]

THE cost of the Union Pacific was reported as $112,259,360, an average of $108,778 a mile.

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RECENTLY PATENTED INVENTIONS.

Railway Appliances.

ELECTRIC CAR BRAKE.—Joseph H. McEvoy, Waterbury, Conn. In this brake the power is supplied by the momentum of the car, but the brakes are set into action electrically, although they may be operated by a brakeman by hand in the usual way. A worm gear connecting mechanism is interposed between the car and its axle to operate a shaft with a drum on which is a chain connected with the brake shoes, the worm gear being made separable and a magnet operating to connect its parts. The brakes may be set into action automatically by the momentnm of the car.

CAR COUPLING.—Samuel G. Wilber, Lake Hill, N. Y. In this coupling a spring-pressed follower block, recessed on its under side, slides in a hollow drawhead, in which is journaled a spring-pressed rock shaft, having a latch to swing in the recess of the follower block, a pin sliding vertically in the drawhead, and there being a crank and lever connection between the rock shaft and the pin. The invention is an improvement on a formerly patented invention of the same inventor, the construction being rendered more compact and certain in operation, the follower block being made sure to trip at the right time for automatic coupling and to hold the link at any necessary inclination to readily enter couplings of dissimilar heights.

SWITCH STAND.—Morris G. Prutzman, Lehigh Gap, Pa. This is an improvement in spindle switch stands, in which the actuating rods are connected with a crank shaft or spindle in the switch stand and adapted to operate in connection with antomatic split switches pressed one way or the other by a flange of the wheel, or which may be operated by hand. The improvement is designed to prevent the switch from standing in an intermediate position, providing also means for raising the standard so as to prevent any lost motion and providing convenient means for locking the spindle and the spindle column and limiting its rotary movement.

CABLE GRIP.—John C. Dean, Millsborough, Pa. Pivoted cross levers have their shorter ends pivotally connected with oppositely arranged grooved jaws, and a draw chain is connected by links with the longer ends of the levers, forming an extremely simple and inexpensive grip, easily applied to a car and a cable to grip the latter so that it cannot accidentally become loose, the pressure increasing with the increased weight of the car. The device is especially adapted for use with coal cars.

Agricultural.

PLOW.—Herman Symmank and Ernst Matthijez, Giddings, Texas. This is a sweepstock with forwardly and downwardly projecting curved heel carrying a sweep holder, on which is pivoted a shoe, with the rear end of which is pivotally connected a link arm, there being means for adjustably connecting the upper end of the link with the heel portion of the beam. A strong, durable and adjustable implement is thus provided for holding sweeps, half shovels, bull tongues, etc., and the stock is not liabie to become choked by weeds.

REAPER OR MOWER.—Alexander Chambers, Tarrytown, N. Y. The main feature of this invention consists in the application to this class of machines of an endless knife and mechanism for driving it, the knife being provided with any approved form of guard, whereby the upper stretch will be a cutting surface and the lower stretch will be prevented from having a cutting action. The finger bar and pulleys thereon have a diagonal position, the pulleys carrying an endless band or knife set at an angle horizontally and returning belowits cutting edge and at a distance in the rear, the lower stretch of knife being protected by a guard.

Miscellaneous.

SHIP'S BRAKE. — Ferdinand Tobias, Munich, Germany. To steer or retard the motion of navigable vessels, according to this invention, an apparatus comprising wings or fins is hinged to the vessel and connected to a toothed quadrant adapted to be operated by a spur wheel driven from the main shaft of the ship's engine through intermediate mechanical gearing.

TYPEWRITING MACHINE. — John A. Toomey, Toledo, Ohio. This invention covers improvements in the cheaper class of typewriters, affording a simple machine to be operated by both hands and having a spacing mechanism which automatically makes the required spaces between the letters and words. The machine has parallel tilting levers on one end of which the characters are represented, while on the opposite ends are pivoted oscillating type plates, there being finger pieces and belts for moving the type plates into printing position and a movable platen arranged above the plates.

CLAMP FOR ELEVATOR ROPES.—Constant K. Decherd, Meriden, Conn. Attached to a post secured to the elevator carriage is a fixed jaw having flanges carrying plates and forming guideways in which slides a movable jaw, a cam lever mounted to turn in the plates being adapted to engage the movable jaw to force it against and clamp the rope. The device is of very simple construction and is designed to positively prevent another person from starting the elevator while the operator is in charge of the car.

PURIFYING ASPHALT. — Augustus S. Cooper, Santa Barbara, Cal. To quickly and effectively separate the impurities from bitumen, this invention provides an apparatus consisting principally of an elongated kettle having a feed hopper and a discharge spout, while a cylindrical screen held on a spiral blade is revolved in the kettle, the screen discharging into an elevator at the end opposite the feed hopper. The other end of the revolving screen discharges the sand and other impurities into an enlarged pit formed in that end of the kettle.

ALUMINUM SOLDER. — Marguerite H. Lançon, Bienne, Switzerland. This is a soldering used as easily as any other known solder and designed to support both drawing and rolling, being applied to pure trade aluminum, or to that which has 98 parts or less of aluminum out of 100, the solder having different proportions, according to whether wire, plates or pieces are operated upon. It is made by melting aluminum and subjecting it to the action of phosphoric acid or its equivalent, adding copper and tin, with sometimes antimony, bismuth and zinc, and stirring the mass.

THERMOMETER. — Francis S. Tomey, 132 Park Road, Aston, Birmingham, England. This is a thermometer for chemical, clinical, or other purposes, made in the ordinary manner, except that the white enamel stripe usually drawn out and incorporated with the stem of the instrument is omitted, but the rear side of the stem is graduated and covered or backed by a protective stripe of fusible white glass paint or enamel fused on, forming a covering which resists acids and facilitates the reading of the scale.

HOSE PLIERS. — Peter W. Allen, Pueblo, Col. In this implement the jaws are arranged to separate as the handles are forced together, one of the jaws having a nose for engaging the looped end of the hose band and the other being furnished with a clamp for engaging the free end of the hose band. A simple and efficient tool is thus provided for applying a hose band of annealed wire to rubber hose, to fasten the hose to conplings and connections.

HOP CARRIAGE.—Isaac W. Cahill and Laban A. Dickinson, Salem, Oregon. This is a vehicle formed of a two-part frame, the sections hinged together and trucks journaled beneath, one truck jonrnaled at the joint of the two parts, while a slatted floor is secured to the frame. This car or carriage is for nse to transfer hops from the drying kiln to the warehouse, and may be used temporarily as part of the floor of the kiln, permitting of the ready drying of the hops and their transfer without injury.

PACKING CASE. — David F. Griffiths, New York City. This is a box preferably made of single side and bottom panels, each panel consisting of a marginal skeleton frame and a single sheet of veneer secured to the top and bottom rails of the frame by tacks, the veneer being also strengthened and secured to the side rails by wires interlaced through apertures. The box combines lightness with strength and durability and may be economically manufactured.

DRESSER FOR BOOTS OR SHOES. — Stephen A. Richards, Fresno, Cal. . This is a self-adjusting device to be placed in boots or shoes to be displayed in show windows, giving the goods the appearance they would have when on the feet. It is made with a base having a shape similar to that of the bottom of a last, on which are mounted and held in position by springs, vamp and heel formers made of plates of varying shape, the compression of the springs permitting the ready insertion of the device in a boot or shoe.

FOLDING UMBRELLA. — Frank. G. Grove and Don. P. Lillard, Luray, Va. The stick of this umbrella is preferably composed of three sections, a ribless cover being secured at one end of the stick and a runner held to slide thereon, while folding braces are pivoted to the runner and secured to the outer edge of the cover. This umbrella is very inexpensive, may be folded into very small compass, or may be nsed as a walking stick.

PIANO OR ORGAN ATTACHMENT.—James W. Carter, Cisco, Texas. This is a guard device mounted to slide in a plate having guide ways, the plate being adapted for attachment to the under side of the key board, where it may be locked in either a folded or extended position. The plate has handle extensions, and by its nse the instrument may be conveniently moved about without danger of defacing it, or the doors, rails, etc., of the building.

POOL TABLE RACK, ETC. — George F. Goss, Wallaceton, Pa. Chutes lead from the pockets to a rack for the balls near the floor, and separate groups of pull rods or cords run to each side of the table, the rods or cords being connected to a rocking frame under the center of the table, the arrangement being such that each player may automatically transfer his ball when pocketed to its proper place in the rack without leaving the table or touching the ball, and so that each player may see that the balls are properly placed, means being also provided for signaling each placing of the ball in the rack and the end of the game, without an attendant.

CLOTHES PIN.—George W. Jones, Richardson, Tex. This pin is preferably formed of spring wire, and has a straight member parallel with the line, while the two ends are bent to form loops, terminating in portions carried above and over the straight member and then downward in close contact therewith. The device adapts itself to lines of different thicknesses, and will hold equally well a bit of lace or a heavy blanket or quilt.

CLOTHES LINE ATTACHMENT. — Leo Oppenheimer, College Point, N. Y. This device comprises a clamp formed of a metallic strip bent in the form of a snap hook, with the upper end of its spring member or tongue overlapping the lower end of its hooked portion, a pulley being journaled in the upper hooked member. The device is more especially designed, where lines are parallel, to prevent the lower strand carrying the clothes from sagging.

MENTHOL CONE. — Thomas D. Vint, Hastings, England. This invention provides for strengthening a menthol cone or stick by means of filaments made to ramify throngh the mass, the filaments, such as feather tips, hair, wool, etc., being first tightly wedged in or secured to the holder, and their cone-like end being then dipped into a mould holding the melted menthol. The cone or stick is thus strengthened so that it is not liable to break off in use.

CANNULA FOR TRACHEOTOMY.—Ernst Hartstein, Goppingen, Germany. This is an improvement in tubes whereby air is admitted to the hinge when the throat is closed by croup, diphtheria, or other cause, the cannnla comprising two tubes fitting one within the other, the outer one being capable of an outward movement independently of the inner tube, with means at the onter ends of the tubes whereby either the inner or the outer tube may be safely and easily changed independently of the other.

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"DAILY RECORD."—Mrs. D. W. Sutter, Lake Linden, Mich. An ordinary sized diary is preferably employed by Mrs. Sutter in making the "Daily Record" book, bnt in place of an index letter on a projecting portion of the onter edge of each leaf, according to the usual manner of making indexes of a book, such place is occupied by the title of each month. In opening the book one can thus readily turn to any month of the year, where it will be found that the days of the week are each given separate pages, *i. e.*, all the Mondays are indicated—a separate space for each—on distinct pages, all the Tuesdays on other pages, etc. There are also additional leaves for memoranda, addresses, etc.

Design.

FUR TRIMMING. — James Jacobson, New York City. This design consists of a ruffled strip presenting reversed apparently curved loops at the side edges, the returned edges following the lines of the loops, and preventing undulating furry figures.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

THE COMPLETE SPORTSMAN. A manual of scientific and practical knowledge. Designed for the instruction and information of all votaries of the gun. By Howland Gasper. New York: *Forest and Stream* Publishing Co. 1893 Square 12mo. Cloth. Pp. xvi, 277; 17 illustrations. Price $2.

By a careful reading of the chapters of this excellent work the sportsman may appropriately equip himself for hunting, attain proficiency in the art of shooting, and enter the fields informed of the habits of the game and most approved methods of hunting. There are already a number of books on hunting adapted for the use of experienced sportsmen; the present work will appeal especially to the amatenr or beginner. The chapter on the selection of firearms for hunting, their use and preservation, is very valuable, and a careful perusal of this section of the work may prevent costly mistakes in the purchase of guns ill adapted to the needs of the sportsman. This book is not padded out with tales of hunting exploits and experiences, but every page bristles with practical information of positive value to whoever desires success in hunting. The chapter on outfit, guns, boats, dogs, etc., is particularly instructive and interesting. The proper appliances and best methods for pursuit of various kinds of game are well set forth, including duck shooting, goose, snipe, quail, rail, grouse, woodcock, deer hunting, bears, squirrel, muskrat, etc. The book is handsomely illustrated and the typography admirable.

SUBJECT MATTER INDEX OF TECHNICAL AND SCIENTIFIC PERIODICALS FOR 1892. Compiled by Dr. R. Rieth. Berlin: Carl Heymanns. New York: B. Westermann & Co. 4to. Pp. 502.

This valuable annual is compiled by the order of the imperial German Patent Office. All of the papers which have appeared in the journals are catalogued in the language in which they were originally published, provided of course that they come within the scope of the work, which is limited to scientific and technical articles. The work is of the greatest value and circulates through the entire scientific world, to which it has become a necessity.

AMERICAN BIG GAME HUNTING. THE BOOK OF THE BOONE AND CROCKETT CLUB. Edited by Theodore Roosevelt and George Bird Grinnell. New York: The *Forest and Stream* Publishing Co. 1893. 12mo, cloth. Pp. 345, plates. Price $2.50.

This work is made up of contributions by members of the Boone and Crockett Club, a well-known association of sportsmen, and is edited by two well-known hunters of big game. In the present volume, which is got up in fine style, the reader may enjoy a rare feast of stories of adventure, the events chronicled having occurred in our own country. Many of the papers are written in excellent style, and we regret that space forbids the publication of the names of the contributors. In the back of the volume will be found the rules of the club, list of members, etc. The volume is a handsome specimen of American book making.

A MANUAL OF TELEPHONY. By W. H. Preece and A. J. Stubbs. London: Whittaker & Co. New York: Macmillan & Co. 1893. 12mo, cloth. Pp. 508, 333 illustrations. Price $4.50.

The rapid strides made in the science of telephony since 1888 have necessitated not the reissue of Preece and Maier's book, "The Telephone," but the publication of an entirely new work, which will undoubtedly receive the gratifying reception with which the former treatise was distinguished. The subject of telephone exchanges is very well treated, the diagrams of connections being especially clear. There has been a want felt for a long time for a good work devoted to the subject of exchanges, and the description in the manual will prove of great value. A chapter is also devoted to cables and one to the limiting distance of speech transmission.

ARITHMETIC OF MAGNETISM AND ELECTRICITY. By John T. Morrow and Thornburn Reid. Lynn, Mass.: Bubier Publishing Co. 1893. Pp. 145. Price $1.

The scope of this little work may be judged from the preface, in which it states that in it there has been no attempt at explanation of the phenomena involved, and no deduction of the rules is given. The object, it states, is to enumerate those rules of electricity and magnetism which are directly connected with their commercial applications. It may be noted that some of the rules do not bear very arithmetical appearances. We would cite, as an example of such, the sixth rule. The phraseology in places is not very exact, as where the author speaks of "moving" a force of one pound. A short section devoted to alternating current apparatus will be fonnd a valuable feature. A few tables and a reasonably full index conclude the work.

ANALYSIS OF MILK AND MILK PRODUCTS. By Henry Leffmann, M.D., and William Beam. Philadelphia: P. Blakiston, Son & Co. 1893. Pp. 92. Price $1.

This excellent mannal, adequately illustrated and with all the requisites of tables and satisfactory index, must be considered a valuable contribution to the growing science of commercial analysis. The sections touch upon the nature and composition of milk, analytical processes of examination, a very suggestive chapter on data for milk inspection, covering variations in composition, such as deficient solids and abnormal milks. Another chapter is devoted to milk products. This gives the general scope of the work. The authors will be recollected as associated in the production of a similar manual on the examination of water.

ANNUAL REGISTER OF THE UNIVERSITY OF CHICAGO. Chicago. 1893. Square 8vo. Pp. 244.

This register contains a full statement of the organization of the University, the faculties and the courses offered during the year, lists of students, requirements for admission, regulations governing the various schools and colleges of the University, a historical notice concerning the University, University clubs and organizations.

FABRIKATION, BERECHNUNG UND VISIREN VON FAESSERN BOETTICHE UND ANDERER GEFAESSE. By Otto Voigt. Vienna: A. Hartleben. 1893. 104 illustrations, tables and 317 pages text.

This publication forms the 201st volume of the chemico-technical library published by A. Hartleben. This handbook will prove to be a valuable assistant for coopers and others engaged in the manufacture of barrels, kegs, tubs, and other vessels, and treats on the tools necessary in the trade, the wood to be selected, the manufacture of the vessels by hand and machinery, the calcnlation and drawing of various forms of heads and other parts and the measuring of the contents of the vessels.

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NOVEMBER, 1893.—(No. 97.)

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Notes & Queries

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Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(5477) C. A. D. writes: 1. I want to make a shocking coil strong enough to hold down three or four men. How much wire, what size, and how is it wound? Where can I get full description and mode of construction of such a machine? A. For powerful induction coils we refer you to our SUPPLEMENT, Nos. 160, 229 and 569, which give full descriptions and illustrations. 2. I have a glass battery jar with a porous cup; the cup is filled up with a black material, a carbon is in the center, there are two little holes in the surface of the black, pitch-like covering. How is said battery charged? Can I convert it into a Bunsen battery? A. The battery is a Leclanche cell. To charge, use a saturated solution of sal ammoniac. It would answer as a Bunsen if the porous cup was cleaned out and a larger amalgamated zinc substituted for the rod. 3. I have an English regimental flute with an ivory head, the ivory is cracked. Do you know of a cement that I could fill up the cracks with so as to make it look all right? A. We quote following from the "Scientific American Cyclopedia of Receipts:" Dissolve 1 part of isinglass and 2 parts of white glue in 30 parts of water, strain and evaporate to 6 parts. Add one-thirtieth part of gum mastic dissolved in ½ part of alcohol; add 1 part of zinc white. When required for use warm and shake up. B. Moisten thoroughly a small quantity of very finely powdered quicklime with white of egg to form a paste. Use at once, clamp parts firmly together and leave for 24 hours. Use as little cement as possible. 4. What is the difference between electricity generated in a battery and that generated by friction? A. The frictional discharge is of enormously high potential and of low quantity, the battery current is the reverse.

(5478) A. H. B. asks: 1. Is one-half ampere of current forced through the body sufficient to cause death? A. The fatal effects of electricity on the human system depend on the nature of the discharge. An alternating or pulsatory current from a dynamo or passed through a coil is particularly fatal, unless the frequency of the alternations is very high. Thus half an ampere may not be injurious, if from a storage battery or if of great steadiness. 2. How high does the voltage have to be to force that amount through the body? If the quantity of current is kept low enough, will a very high voltage passed through a person do any harm? A. A high voltage with a very small quantity will kill. One-half ampere would require about 500 volts to pass the body, but this may vary greatly. 3. Is electricity magnetism in motion? A. No. Magnetism is theoretically due to circular currents of electricity, the planes of the circles at right angles to the axis of magnetization. 4. Has the electric pressure on the earth ever been estimated, or in other words, how high is its voltage above the zero point? A. The earth's potential is arbitrarily taken as zero. We have no reliable figure as to its absolute potential. 5. Does gravity act as a conducting medium for the transmission of heat from the sun to the earth? A. Gravity does not act as described. 6. Does the heat we receive from the sun have any return circuit? If so, does it return in the form of heat? A. No return circuit for heat can be deduced. An equalization of temperature of all objects is the tendency of the universe.

(5479) E. H. H. asks for the method and quantity of foreign material employed in the burning of copperas for making red oxide. Also the kind of retort to be used and the manner of constructing the same. A. The following are two methods: 1. Green sulphate of iron is calcined until the water of crystallization is expelled, then roasted at a high heat until no more acid vapors escape. It is cooled, washed with water until the latter has no acid reaction, and is dried. 2. To 25 parts of green sulphate of iron 11 parts common salt are added. The mass is mixed, calcined and treated as above. For the finest product a second calcination is given. Sometimes a small quantity, 2 or 3 per cent only, of salt is added —sometimes a little sulphur. For the calcining, if the acid is to be saved, cast iron stills are sometimes used with condensers. The usual plan is to do the calcining in muffles, and the acid may be saved or allowed to escape. Several muffles may be built into one arch or chamber like coal gas retort furnaces.

(5480) L. A. writes: I have now been a reader of your valuable papers, the SCIENTIFIC AMERICAN and SUPPLEMENT, for over 15 years, and I read in them occasionally of a new formula for platinotype printing process, as in SUPPLEMENT, No. 927. I have never been able yet to find an easy way of producing potassium chloro-platinite. A. Platinous chloride is first made by heating platinic chloride to about 200° C. (392° Fah.) or by passing sulphurous acid gas through a solution of platinic chloride. Platinous chloride is insoluble in water but soluble in hydrochloric acid. To its solution in the latter acid is added potassium chloride in solution. For 196·7 parts of metallic platinum or for 338·7 parts of platinic chloride 149·2 parts at least of potassium chloride are needed. On mixture, the double salt potassium chloro-platinite is deposited. See Fownes' "Chemistry," p. p. 466, 467.

(5481) F. P. R. writes: I have a store window about 11 feet high and 6 feet wide, which during the winter is covered with frost. I want an application which will keep my window clear. A. The cause of frost on windows should be removed, either by keeping the air in the store so dry that its moisture will not condense upon the cold glass or entirely inclose the window from the inside air and give the inclosed space a free ventilation from the outside by means of two or more pipes at bottom and top so arranged with hoods as to keep out rain and dust. In freezing weather the ventilation will allow the dry outside air, to circulate behind the glass, and thus prevent the precipitation of moisture by contact with a colder surface. In moderate weather the ventilators may be closed to keep out dust.

(5482) L. H. asks the process of making the ware called copper oxide. What I mean by copper oxide (I am not positive if that is the right name) is a kind of deep colored red or polish which is put on copper wares, such as lamp bodies, fancy vases, etc. A. The copper coloring is termed royal copper from its intense red color. It is produced by dipping in a solution of 2 drachms sulphide of antimony, 1 ounce pearlash to 1 pint of water, or by boiling the copper articles for 15 minutes in a strong solution of tartar and water.

(5483) L. E. L. writes: If a 1 horse power electric motor requires 50 cells of a zinc carbon battery, will a 3 horse power motor require three times as many cells, or will the zincs and carbons in the fifty cells have to be enlarged, or both? A. The battery must be enlarged as suggested, and the result can be reached in either way spoken of, according to the winding of the motors. But if the plates are much enlarged, the cells should be also, as more liquid will be required to maintain the action for a given time.

(5484) A. F. H. informs us that the article on the German search light which appeared in No. 10 of the current volume of the SCIENTIFIC AMERICAN is in error in stating that the current was not furnished to all of the lights. He states that all four of the lights were in operation most of the time, and that two more were added, which were also supplied with a current when needed.

(5485) T. C. K. asks: 1. How many cubic feet are necessary for a balloon which should ascend in the air to the height of about 300 feet with 250 pounds weight? For the balloon there is no gas used, but hot air. How much heat is necessary? What is the best fuel? A. Balloon should contain 12,000 cubic feet, in which the air should average 250° Fah. with the atmosphere at 70°. Alcohol is the best for heating the air as it makes no smoke. See also SCIENTIFIC AMERICAN, Vol. 65, No. 10.

(5486) P. H. W., Sandy Hill, writes: Please tell me whether it is safe to turn slops and waste water from kitchen sinks into wells near residences. Our people have formerly used wells to supply our families with water, but we have water brought into the village of good quality, and many parties have discarded the use of their wells and have the village water brought into their houses, and turned the waste from their sinks into the wells. These wells are covered up. Will the natural currents through these wells carry off or purify these slops, or will the water in them be contaminated and send up through the waste pipes a bad stench, subjecting the family to diphtheria and other diseases not pleasant to contemplate? In my case the well is covered down some 8 feet below the surface. We find living water at 6 to 8 feet. Our wells are sunk to about 12 or 14 feet, soil is sandy and porous, water usually very good, but our hydrant water is cheap and of first quality, so we are making the change in general. Now, can I turn waste from my sink into the well with impunity? Object is to get rid of frost. The land is so level it is difficult to get rid of the waste. Water stands on the top of the ground in low places in wet seasons for weeks at a time. Usually when digging to set fence posts in early spring we find living water. A. The discharge of house waste or sewage into the wells of a town is a most dangerous expedient in the change of the method of water supply. What would be a convenience to one household might be poison to a neighbor, or a scourge of typhoid fever or diphtheria. The well water belongs to a subterranean circulating system in which the water is in constant movement toward a lower level or toward the streams of a valley. The soluble matter of sewage is carried along with the subterranean current crossing the wells of neighbors and contaminating their water. This effect would be strongly developed in the sandy subsoil of your town, and has been proved by analysis to infect large districts on the drainage side of towns. The increased use of water induced by a water works largely increases the sewage, and a town soil where no provision is made for sewers, soon becomes saturated with sewage and its malarial miasma. This is no fancy idea, but a stern reality in many towns and cities that, after epidemics have afflicted them, have reluctantly adopted a sewerage system. We advise you to keep your sewage in shallow cesspools until all have discarded the use of wells, then if necessary use the wells until a sewerage can be made.

(5487) G. M. B. asks a method of finding the circumference of an ellipse, given the major and minor axes, also to find the major and minor axes, given the circumference and the ratio of the two axes. A. For the circumference of an ellipse, multiply the square root of half the sum of the squares of two diameters by 3·1416. For example an ellipse of diameters 4 inches and 2 inches, then $\frac{4^2+2^2}{2}=10$, and $\sqrt{10}=3·16+$, and $3·16+\times 3·14=9·9224''+$. By reversing the process as above for obtaining the diameters with a fixed ratio, the formula will be illustrated as follows:

$\frac{9·9224}{3·14}=3·16+$, and $3·16^2+=10\times 2=20$, which is the sum of the squares of the two diameters. The ratio being 2, its square is 4. Then $20-2^2=16$, the square root of which is one of the diameters. Then $20-16=4$, the square root of which is 2, the other diameter. In the same way various elliptic diameters for a given circumference may be assigned between the limit of a circle and a straight line of one half length of the circumference.

(5488) J. McB., Pa., asks: Please describe this bug, found in our bed. It stung both my wife and me. There has not been a bed bug in this house for ten years. A. Reply by Professor C. V. Riley.—The insect sent is one of the tortoise beetles commonly known as the mottled tortoise beetle (Coptocycla guttata). This insect feeds in all stages upon the sweet potato and also upon the morning glory and other allied plants. Its larva is a peculiar oval, flattened, spiny creature, possessing, in common with those of other members of the family Cassidae, two long spines which are recurved over the back and carry the excrement, disguising it so that it would hardly be taken for an insect. In common with many other small beetles, this little fellow can pinch the skin of human beings with its jaws, and will do so under exceptional circumstances, but it possesses no poison glands and its extremely rare bite is perfectly harmless. It is probable that morning glory vines grow in the immediate neighborhood and that this little beetle sought the house for warm and comfortable hibernating quarters. The tortoise beetles are characterized not only by their having the general form of a tortoise, but by the brilliant golden and metallic coloring which they often present.

(5489) C. S. E. writes: 1. I wish to light a room about three nights in a week and about three hours each night, with a four candle power ruby colored incandescent lamp. Will you please tell me through your valuable paper which would be the cheapest. To run it with gravity batteries (if so, how many cells?) or to run it with a storage battery charged with gravities; and if the latter is the cheapest, how many cells of storage battery would it require, each cell having but two plates eight inches by twelve, and the number of cells of gravity per cell of storage? A. If you use a battery, a storage battery is the only suitable one. Four cells would answer of size stated. For charging use at least ten gravity cells in series. If these were paralleled by one or two more sets of ten, the charging would be much quicker. 2. Also where above lamp can be obtained? A. Address the Edison Lamp Company, Harrison, N. J. 3. Can the amperage of a battery be found by measuring the amount of water it will electrolyze in a given time? A. Yes. 4. Is the amount electrolyzed affected by the conductivity of the water? A. The amount for given E. M. F. is so affected because increase of conductivity increases the amperage. The same quantity per ampere is always electrolyzed.

(5490) J. H. T. asks: 1. Can water confined in a glass vessel be charged with electricity? A. An electric charge resides on the surface of a conductor only. The water may be charged as regards its surface both next to glass and the upper air-water surface. 2. If so, how much electricity will one gallon of water receive and how long retain it? A. This depends on shape of containing vessel and on specific inductive capacity of the dielectric, on its thickness, and on the relation of the charged surface to the oppositely charged. How can I do it? If with galvanic battery, of what size? A. Paste a strip of tin foil around the outside of the vessel. Connect one wire to this, the other to the water. The charge will be exceedingly slight; with a galvanic battery it will be hardly recognizable. 4. What are the best publications on electric therapeutics and electric baths? A. We recommend and can supply you with the following books relating to the subject you refer to: Morgan's "Electro-Therapeutics and Physiology," price $6,50; Hayes' "Electro-Thermal Baths," price $1.50; Hayne's "Electro-Therapeutics," price $2.50 mailed.

(5491) M. W. H. says: Will you be so kind as to tell me the origin of the idea that a dog trotting over a bridge will do it (the bridge) more harm than a regiment of soldiers marching over it? Is there any foundation for that idea? If so, why? I see no reason why it should be the case, but have heard public speakers use it to point a moral. A. The idea of the dog trot in sympathy with the vibration of bridges is very old, and came from the observed fact that a dog trotting on an unbraced or light bridge sets the whole bridge to vibrating, which is a source of danger. A body of soldiers does the same when marching to time, but the military rule is to break step when crossing a bridge; then there is no synchronal relation between the irregular steps and the rhythm of the bridge. The moral is very slender, and only points to great effects from small causes.

(5492) I. V. R. writes: In October 14 issue you say in reply to question 5424 that 6 storage cells will run a ½ horse power motor 6 hours per day. 1. What are the dimensions, weight, and the cost of one of those cells? A. The general dimensions of a single cell of such batteries as we referred to are: Floor space 8½×11 inches, height 16½ inches, weight 125 pounds. You can use perhaps a slightly smaller cell. For cost and fuller particulars address the Brush Electric Company, Cleveland, Ohio. 2. Could the motor be used in any way to recharge the storage cell? If so, what time would be required to charge the 6 cells with ½ horse power motor for a 6 hours' run? A. If the motor has cast iron fields, or if the fields retain enough residual magnetism to charge themselves, you may run the motor as a dynamo and recharge the cells in about six hours. If the motor run as a dynamo does not give enough voltage, charge the cells 3 at a time in series.

(5493) A. R. S. writes: If a boat 16 feet long, 54 inches beam, weighing 400 pounds, carrying six persons, makes 7 miles an hour, using a gasoline engine, what is the highest speed that a boat 16 feet long, 40 inches beam, weighing 250 pounds, carrying 3 or 4 persons, using the same engine but increasing the pitch of screw to absorb the full power? How much increase in pitch of the screw would the difference in the boats allow? If I start with the light boat from Omaha, Neb., down the Missouri river and Mississippi, up the Ohio, through the canal, down the Maumee, through Lake Erie, down Niagara River to the St. Lawrence, how many locks would I pass and do they charge to go through them? If so, how much? Would they object to my carrying the boat around the locks? Would I receive a license to make the trip? The company says no licenses are required with their engine. A. By increasing the pitch of the screw about 25 per cent in the lighter boat, you may possibly make between 8 and 9 miles per hour. You require no license. We do not know the number of locks or toll.

(5494) H. A. W. says: I wish to make a mixture for inhaling for catarrh and bronchial trouble, to contain oil of tar, camphor, etc. Can you give me the proper proportions, and if there is some other ingredient that will be good? A. Mix together ½ fluid ounce tincture of cubebs and 20 drops liquid cabolic acid. Add the mixture to ½ pint of hot water in an inhaler. Or heat tar with a little carbonate of potash over a spirit lamp.

(5495) H. E. M. says: I have frequently noticed a fine thread similar to a cobweb attached to points in close proximity. They are more noticeable in the morning and when a dew has fallen. I have seen them along the rails of the railroad fastened to the upper and lower flanges. They appear to be the work of an animal, as guy threads are attached. We also see similar threads flying through the air more during the fall of the year. Can you please explain? A. The floating fibers in the air and the fibers on fences, rails, and bushes are the product of spiders, made more apparent by the falling dew attaching to and enlarging the appearance of the fibers by its vesicular form.

(5496) W. E. S. writes: I have a well 22 feet deep and 100 feet from my barn. I have a 1 inch pipe laid from well to barn connected with a single action force pump, but I fail to get water. Will you please tell me what the trouble is? A. Your suction pipe should be perfectly air tight; have a foot valve and strainer on the end of the pipe in the well. The pipe should be charged with water at the highest point or through the pump, which if a good one with moderately tight piston and valves should pull the water easily, supposing that the pipe is laid straight or without undulation that would retain air, which by its cushioning would make the pump draw on an elastic air cushion instead of solid water.

(5497) M. S. E. writes: Is there any cheap method of bronzing or otherwise preventing steel tools, such as gauges, straight edges, etc., from rusting in this moist climate? A. Bronzing tools in a manner to prevent rust is not practicable with the users of tools. A good method of treatment is to warm the tools so as to be free from moisture and varnish with boiled linseed oil and thoroughly dry in the sun or an oven not hot enough to draw the temper. The varnish will only wear off in spots where the tools are handled. Another way, if desirable to keep the tools bright, is to wipe them often with vaseline.

(5498) E. P. G. says: The bright star Capella in Auriga appeared to change from a bright yellow or bronze to a violet. One could see the change in the light. The star would look half bright yellow and the other violet. Colors seemed to pass off on the side next to the pole. It was the plainest from the horizon to about one-fifth of the way to the zenith. Is there any regularity in the change of color? A. The changeable colors of the stars as you state is due to chromatic aberration in your telescope.

(5499) H. R. E. asks: What degree of heat will be required to melt pure aluminum? What degree of heat will be required to melt silicate of alumina, chemically combined as follows: Hygroscopic water 0·74; combined water, 16·42; silica, 40·80; alumina, 35·37; ferrous oxide, 3·07; lime, 0·30; magnesia, trace; potash, 0·56; soda, 0·46. A. Pure aluminum melts at 600° according to Pictet and at 850° according to Van der Weyde, authorities not agreeing upon the exact melting point. The composition stated nearly resembles pure fire clay, which requires about 3'500° Fah. to melt.

(5500) Amateur writes: I wish to silver plate with a battery, and from motives of economy could use some silver solder cuttings 80 to 90 per cent pure to make the cyanide, only I fear the result would not be good. A friend says if I use a pure silver anode at the positive pole, only pure silver will be eliminated and deposited at the negative. Failing this being the case, how can I purify the silver quickest, and wet or dry? A. Dissolve in nitric acid. Add just enough sulphuric acid to precipitate the lead as sulphate. Filter or decant after standing and treat by the regular process.

(5501) Library Harvard College: Can you tell us the composition and method of employment of a cement for joining glass, that is not affected by acids or alcohol? Such a cement is used in Germany in making boxes of plate glass. A. Use Canada balsam; heat the glass slightly before applying. If the balsam is too thick, thin with benzole. Tie the pieces together or apply clamps so that there will be firm pressure until the cement has set.

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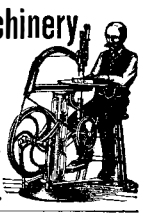

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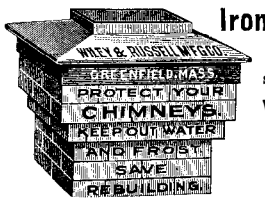

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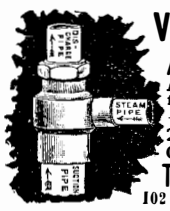

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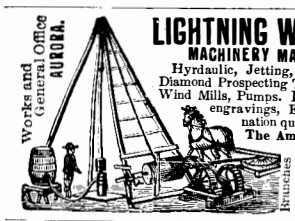

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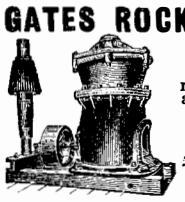

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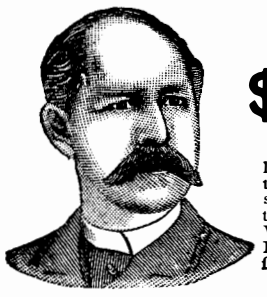

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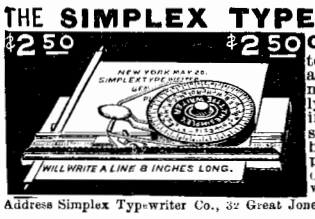

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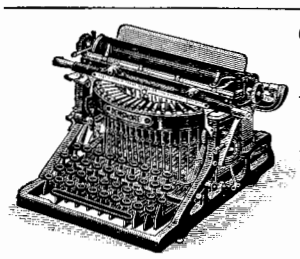

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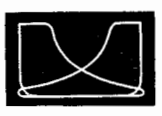

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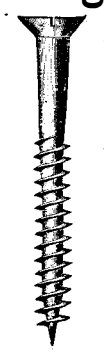

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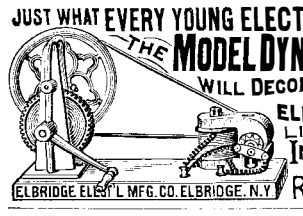
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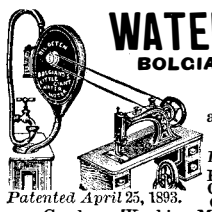

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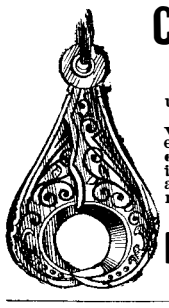

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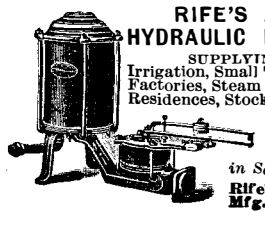

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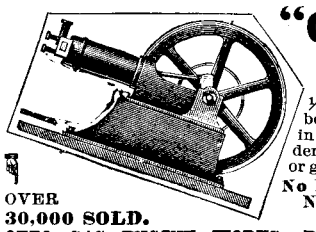

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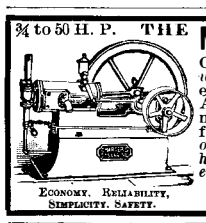

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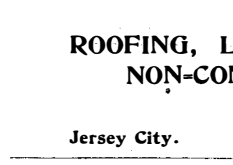

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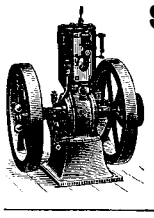

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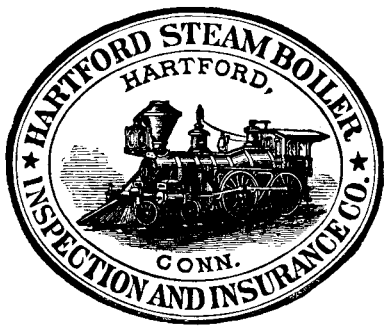

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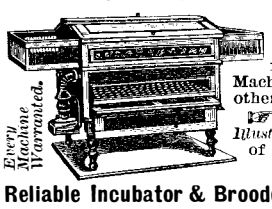

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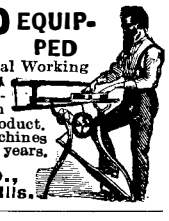

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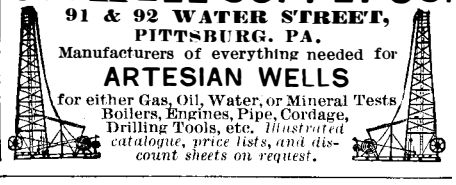

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